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Technology Department

Welcome to Milwaukee

The state of Wisconsin and the city of Milwaukee are happy to play hosts to the American Vocational Association when its members meet to hold their annual convention November 29 and 30, and December 1, 2, and 3.

Milwaukee, the convention city, is especially anxious to do everything in its power to make the stay of the A.V.A. visitors in the city both helpful and enjoyable.

The local convention committees have labored hard to make adequate preparations for this important meeting. The program promises to be exceptionally good. The city offers unusually fine opportunities for visits to schools, manufacturing and distributing firms, a splendid museum and library, and many other places of interest.

The city is nationally noted for its hospitality. It says with all sincerity — come and visit us, you are most welcome.

The Annual Index

This issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION completes Volume 37. For those who bind their magazines, a limited number of the annual index will be printed. Be sure to write for it while the supply lasts. The index will be sent gratis.

This Month's Cover

Our cover picture this month shows a scene in northern California picturing stacks of logs piled for seasoning before they are loaded onto cars and taken to the mill. Photograph by Ed. J. Charvet, Santa Barbara, Calif.

Coming Conventions

Nov. 26–27. Central Association of Science and Mathematics Teachers, at Indianapolis, Ind. Headquarters, Claypool Hotel. Convention chairman, Mrs. Marie Wilcox, Washington High School, Indianapolis, Ind.

Nov. 28–29. National Association of Industrial Teacher Trainers at Milwaukee, Wis. Headquarters, Hotel Schroeder. Chairman, Dr. Harold Silvius, Wayne University, Detroit, Mich.

Nov. 28–Dec. 3. National Council of Local Administrators of Vocational Education and Practical Arts at Milwaukee, Wis. Headquarters, Hotel Schroeder. Secretary, Frank Huffaker, 215 Chestnut St., Chattanooga 3, Tenn.

Nov. 29–30. National Association of State Directors of Vocational Education at Milwaukee, Wis. Headquarters, Hotel Schroeder. President, Ernest J. Simon, 216 E. Monroe St., Springfield, Ill.

Nov. 29–Dec. 4. American Vocational Association at Milwaukee, Wis. Headquarters, Milwaukee Auditorium. Executive Secretary, L. H. Dennis, 1010 Vermont Ave., Washington 5, D. C. Local chairman, William J. Rasche, Milwaukee Vocational and Adult Education School, Milwaukee 3, Wis.

Nov. 30–Dec. 1. American Association of Technical High Schools at Milwaukee, Wis. Headquarters, Hotel Schroeder. Chairman, William N. Fenninger, 23 South Pearl St., Albany, N. Y.

Dec. 27–31. National Science Teachers, at Washington, D. C. Headquarters, 1201 — 16th St., N.W., Washington, D. C. Secretary, Dr. Hanor A. Welb, George Peabody Teachers College, Nashville, Tenn.

Dec. 29–30. National Council of Teachers of Mathematics at Columbus, Ohio. Headquarters, Baker Hall, Ohio State University. Room reservations: Oscar Schaaf, Room 120 Arps Hall, Ohio State University, Columbus, Ohio.

VOL. 37, NO. 10 DECEMBER, 1948

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

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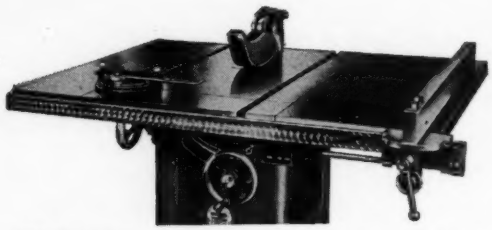

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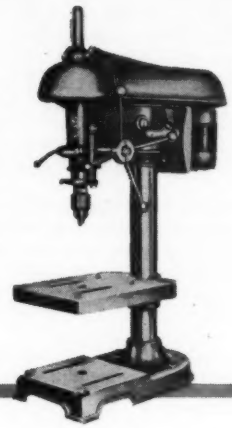

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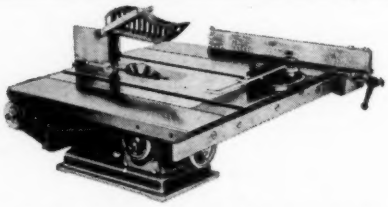

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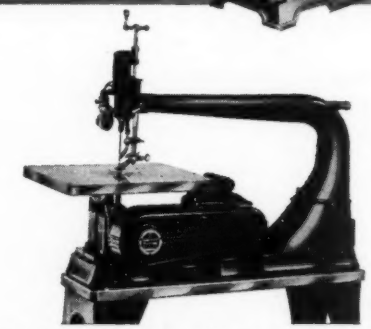

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The Milwaukee Vocational and Adult Schools

ROBERT W. TARBELL
First Vice-Principal
Milwaukee Vocational and Adult Schools
Milwaukee, Wis.

Wisconsin has made great strides in vocational education. There may be several reasons for this, some more obvious than others. Since the vocational law was passed in 1911, the idea has taken hold on the people in the state until employer and employee, juveniles and adults, have come to look upon the plan for extended preparation beyond the formal school as necessary and desirable. And Mr. Average Citizen looks on with approval. Behind it all there have been visions of things to come, directed by good leadership and supported by a receptive public. There has been a definite will to learn.

The Wisconsin Idea

Air castles come first. Ground structures follow. Wisconsin had its Charles McCarthy in whom nature had combined the vision, the ingenuity, and the driving force to crystallize an idea into action. The underprivileged youngsters in the textile mills of Massachusetts first caught his attention. They needed training for future occupations and better preparation for citizenship. McCarthy worked and studied, was admitted to the bar and later came to Madison, Wis., taking a position as law reference librarian at the Capitol. Here he had much to do in providing legislators with reference material to aid them in the preparation of bills for the legislature. Frequent contact with senators and assemblymen increased their confidence in him. In 1909 an interim committee was appointed and directed to make a study of the continuation schools of Europe and the British Isles, and to bring back a report for the 1911 legislature. McCarthy was the moving spirit in all of this and saw a law enacted in 1911 providing a new school system for the people who needed it most.

Main building of Milwaukee Vocational School

The Vocational School Law

This law of 1911 recognized that four groups of people in the state needed special education, as follows:

1. Boys and girls working on jobs while still in the compulsory school age bracket. The age bracket was then 14 to 16 years. School attendance was one-half day per week.

2. Boys and girls in the above age bracket, temporarily unemployed. They were to attend school full time until another job was secured.

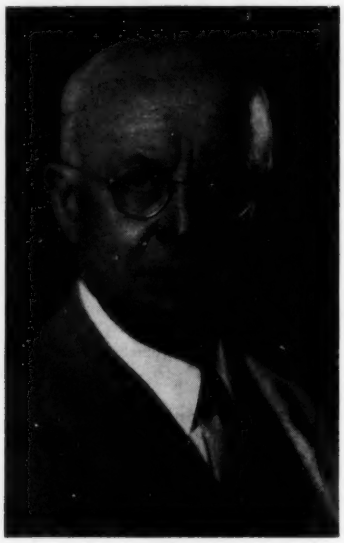
3. Apprentices who were indentured to an employer to learn a trade were to attend school one-half day per week until the required schooling was completed.

4. A school for adults who wished to attend classes voluntarily.

As the years went by the law was strengthened to provide greater opportunities for an education for these several groups.

The Milwaukee Vocational School opened its doors in November, 1912. This was no ordinary event. Schools were fully accepted, of course, but this was something new. Students left their jobs to go to class. The work station was idle during the absence. This meant some reorganization by employers. And if it seemed a bit odd for adults to go back to learn in evening schools, the timidity began to wear off, and the grownups registered in increasing numbers.

To read the story of this school is to catch the philosophy of its founder, Dr. Robert L. Cooley. During a period of thirty years he built a great institution and filled it with students. Starting with an unpopular law, not understood and not accepted by many folk, he won the confidence and support of people about him. To carry the message that education pays, he appeared before civic groups, tax bodies, employers and employees, and in legislative halls. People learn by doing, and the Milwaukee Vocational School provided the opportunity



Dr. R. L. Cooley, founder and first director of the Milwaukee Vocational School

for them to advance according to their capacities and in the chosen field. Dr. Cooley frequently said that the school would have no quarrel with a student's antecedents, but would start where the student left off. In keeping with this policy new Americans came to learn the fundamentals of English and citizenship, young boys took the initial training steps in an occupation preparatory to seeking employment, while others came to receive information and skill supplementary to the daily job.

Rather early in the history of the school it was necessary to decide upon a policy in the matter of educating working boys and girls. It is natural for boys to want a good job. They will prepare for this and actively seek advancement. They will have the responsibility of bringing in a pay check throughout the working years and up to retirement. The occupational choice is the initial step in preparing to function. It may be in any of the mechanical trades in the community, in business, in some special service or in a public capacity. Whatever the choice, there will be a body of information to master and skills to acquire as the student moves forward to accomplishment.

Young women need different opportunities. While some definitely choose to enter the business field as stenographers, bookkeepers, saleswomen, etc., others select cosmetology, the needle trades, and other occupations. These are given definite instruction to prepare them for a place in the world of work. However, many do not make such a selection. They expect to work but a few years and then will marry and become homemakers. A survey made in this school showed that girls were marrying at about twenty years of age. The greatest service this school can offer to these girls and to society at large is to prepare them for a job as homemaker, which will last for forty years or more, rather than to train them as a power machine operator, and find them working at it for six months.

Adults who attend voluntarily choose their courses, with the aid of a guidance counselor, and are interested quite largely in specific areas. Among the adults there are those who plan and follow through on broad programs, extending over a period of years.

Expansion of Curriculums

The law of 1911 provided instruction for four groups of people, as already mentioned. That original concept still stands. But over the years the public has been asking for a variety of courses. Fortunately the statutes do not limit materially the offerings that may be made. If the demand is sufficient, if the school has facilities, and the budget will permit, new programs of instruction may be provided. It is understood, of course, that one important consideration is an adequate teaching staff.

The Milwaukee Vocational School has had a policy of long standing that classes will be provided as quickly as possible to meet the demand. In the industrial department there are many scores of courses. Where boys at one time might choose *machine shop* as a course, it is now possible to select from a great many phases of the trade. Differentiation makes it possible for a student to start at the proper level and make better progress according to his capacity. The same can be said about the other industrial areas.

For a long time employers, employees,

Dr. William F. Rasche, director and principal, who succeeded Dr. Cooley

and school people have been working on a plan of related instruction to supplement occupational skill in the manual processes. That can be said for occupations in general. It is one thing to have skill with tools and good co-ordination. This means precise performance. Those factors have always been essential. But with the advent of more complicated machinery and greater precision, head work is sharing the field equally with the hands. Tradesmen must understand more about the materials used, must be able to make trade calculations, read the drawings, make sketches, be familiar with the operations and be alert to safety precautions, production requirements and a host of things considered very little in grandfather's day.

The electrical laboratory

Machine-shop practice

Increase of Adult Classes

The depression of 1929 brought many people back to school. Some of these felt the need of a high school diploma. Their available time practically precluded entrance into the established high schools in the city. A high school for adults was inaugurated here and has been open both day and evening to students who wish to work toward a diploma. It is accredited with the North Central Association. A vocational junior college, two years in length, has also been established, offering work on the post high school level and also giving intensive preparation in the chosen vocation. The academic and related subjects are accredited at the University of Wisconsin. Then there is a five-year Evening Technical Engineering Division for high school graduates, offering several fields for specialization. There is a school of nursing, and an elementary school for those who wish to complete the requirements for an eighth-grade certificate. The apprentice division is especially designed to give related and supplementary instruction to indentured apprentices. All the different schools, together with the business education department and the homemaking department combine to provide the instruction needed by great numbers of people. The original four groups of people mentioned in the law of 1911 have developed into a number of divisions and departments.

It is never too late to go to school. The old theory that we cease to learn as we grow to maturity is invalid. Where there is sustained interest there will be continued progress. It would be easy to theorize on this and build a fine case for education. But we are convinced more by illustrations than we are by reasoning, and a few cases will serve the purpose. The following students are listed by number.

Studying aircraft engines

The class in barbering

Student No. 1, a laborer, thirty years old, unemployed, came to school to inquire about welding. Had no experience in it. Said he wished to learn it that afternoon and be ready to take a job the next day. He was informed that he could not learn to weld that quickly. After conference with a guidance counselor he entered a welding class and started to master the processes.

Student No. 2, a clerk in a storehouse of a factory was encouraged to take up typewriting and bookkeeping in evening classes, thus preparing himself to handle the records in the store.

Student No. 3, a sheet-metal worker, about 35 years old, came to school for help. Told the man with whom he talked that he was making no progress. Had worked at several jobs but liked sheet metal best. During the conference it was revealed that he was very weak on sheet-metal calculations, could not make even a simple layout, was not informed on many of the properties of the materials of the trade, and lacked skill in some of the operations. The first step was to convince him of the expanding nature of the occupation and then find a class suited to his level.

Student No. 4 was a woman 59 years old, whose schooling had been interrupted at the age of 13 before she had finished the eighth grade. From her own comments it was learned that she had waited 46 years

A class in clothing

The cosmetology class

Capping exercises — graduation of practical nurses

for her eighth-grade certificate. She had taken up her program where it had been interrupted.

The above cases are typical of countless others where adults have made good progress and have profited by it.

Robert L. Cooley Auditorium

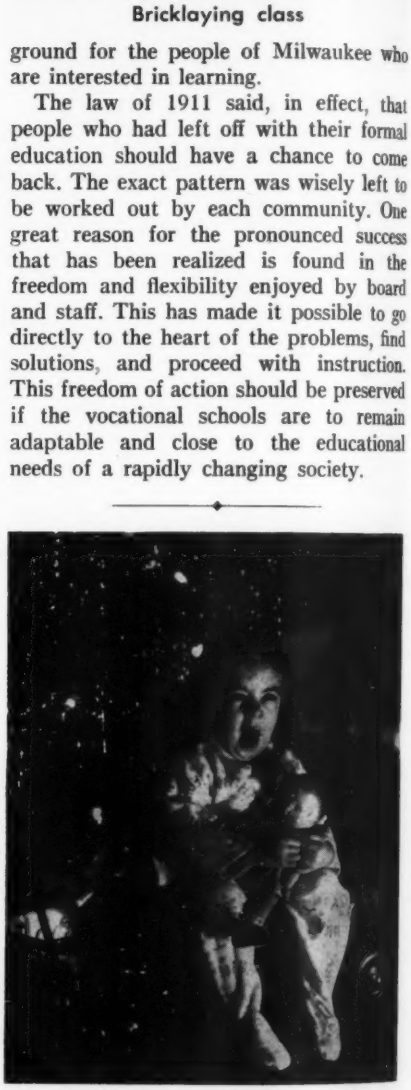
The Milwaukee Vocational School and Dr. Cooley were synonymous for many years. He went in and out among his fellow citizens in the city and state, telling the story that prosperity comes through better understanding. He had the courage to build a different kind of school. He believed that people of all grades and classes in society could learn and move forward. He looked ahead to the day when the entire community would recognize that education pays. Unbounded zeal and straight thinking won the admiration of city and state.

After his retirement from active service the board of vocational education, which is the administrative body directing the affairs of this school, voted to name the large auditorium in his honor. This auditorium has the main entrance on the second floor. There are two balconies. The total seating capacity is about 2000. There is a large stage, a pipe organ, and the necessary lighting and other equipment for modern stage work. The auditorium is used several times a day for assembly purposes. It is also open for school concerts, graduation exercises, and other meetings of a similar nature incident to the operation of a large school. Safety schools are held there under the auspices of the fire or police departments of the city. Milwaukee's own Town Hall, a public forum, where speakers of national renown present their views, will hold its meetings in this auditorium. On the wall hangs an oil painting of Dr. Cooley, placed there by a group of admirers.

This auditorium will be dedicated to the founder of the school on December 1, 1948, at the time of the meeting of the American Vocational Association in Milwaukee. It will be named the Robert L. Cooley Auditorium. In front of the entrances are recessed exhibit cases, lighted and spacious enough for large exhibits. This auditorium is a common meeting ground for the people of Milwaukee who are interested in learning.

Bricklaying class

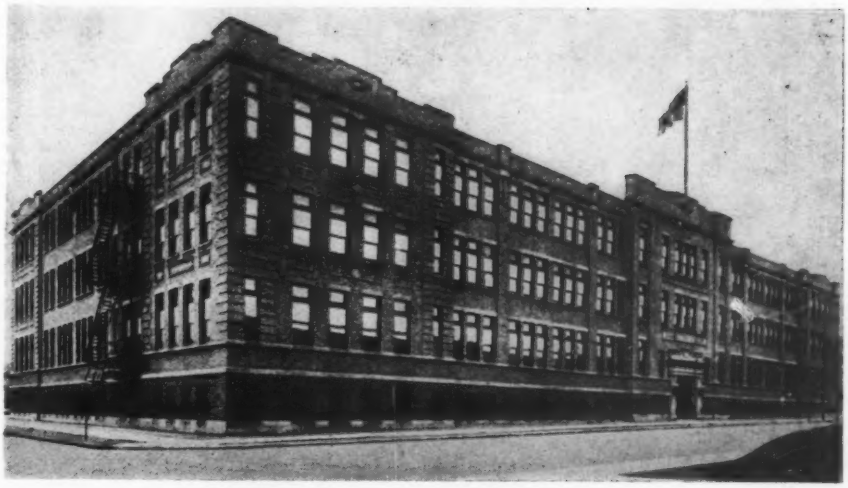
The law of 1911 said, in effect, that people who had left off with their formal education should have a chance to come back. The exact pattern was wisely left to be worked out by each community. One great reason for the pronounced success that has been realized is found in the freedom and flexibility enjoyed by board and staff. This has made it possible to go directly to the heart of the problems, find solutions, and proceed with instruction. This freedom of action should be preserved if the vocational schools are to remain adaptable and close to the educational needs of a rapidly changing society.



This picture, "Christmas Yawning," taken by Jack Gibbs, Creighton Prep School Student, Omaha, Neb., was awarded a First Prize of $100 in Class V — Babies and Small Children — in the Third Annual 1948 National High School photographic awards

Milwaukee Boys' Trade and Technical High School

FRED. W. ZIEGENHAGEN
Principal, Boys' Trade and Technical High School
Milwaukee, Wis.



Boys' Trade and Technical High School

A great surge for expansion of education by the incorporation of vocational and industrial-arts training into the curriculum was experienced in the educational field as early as 1906. It was then that a general interest, manifested throughout the United States, particularly in industrial areas, motivated many educators and others to travel to Europe to study the continental systems of vocational education.

It was logical that in the Milwaukee area the general trend should manifest itself, because during that time there was an acute shortage of skilled craftsmen and a still greater shortage of individuals interested in preparing themselves for the crafts. It was then that far-looking industrialists, keenly interested in education, got together and proposed a trade training school which would assist young boys in entering the skilled crafts, particularly in the metal and the building trades fields. This thought proved rather popular, and many outstanding industrialists in Milwaukee agreed to subscribe to the program and, as private individuals, to subscribe financial aid toward this end.

Lowell P. Goodrich, superintendent of schools, Milwaukee, Wis.

In the latter part of 1906, the Boys' Trade School, now the Boys' Trade and Technical High School, opened its doors as a private school to about fifty students. In a very short time, so much interest was shown in the training of these pupils that the directors of the school saw an opportunity for expansion, such expansion to take place under the auspices and the guidance of the Milwaukee Public School system.

Thus it was that several years after the school had opened its doors as a private school, it became a part of the Milwaukee Public School system. Under the able and wise guidance of the late Charles F. Perry, the trade school grew to incorporate many of the leading metal and building trades in the Milwaukee area. During this period there was a general awakening throughout the country in the development of secondary education, and Superintendent Emeritus Milton C. Potter suggested that a complete high school course be incorporated with the trade school training at our school. It was then that the school was officially named the Boys' Trade and Technical High School.

This proved to be an exceedingly wise provision, since the school doubled its enrollment every year for many years until it became necessary to discontinue temporarily the ninth grade in our school. During the depression years when youth, because of the lack of employment, remained in school considerably longer than at the present time, many of our students were able before their graduation to finish the high school course and our trade training course, which requires about five to

Fred W. Ziegenhagen, principal, Boys' Trade and Technical High School, Milwaukee, Wis.

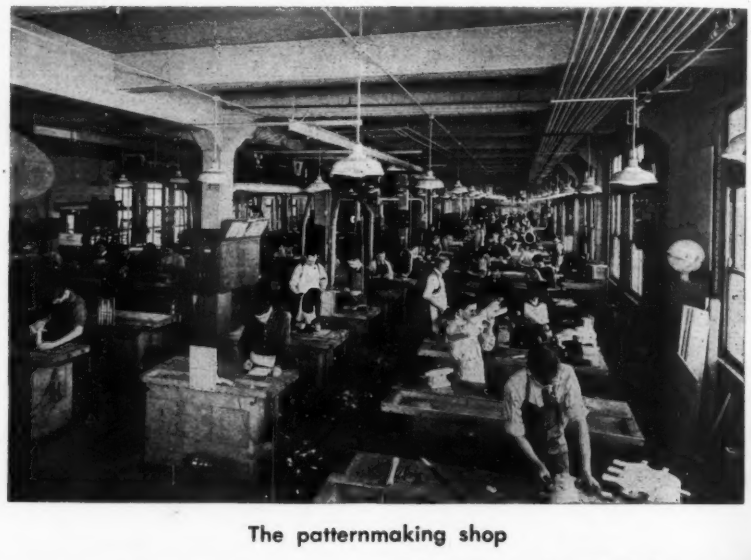
The drafting room

five and one half years of training beyond the eighth grade.

It was then that we had two divisions in our school as follows: The Trade Division, which required the completion of the ninth grade in English, mathematics, and science and approximately 2300 hours of trade training work together with applied drawing; and another division which incorporated six semesters of specialized shop and five semesters of specialized drawing in the various technical fields, together with a well-balanced academic program, particularly emphasizing English, mathematics, science, and social science.

We are now ready for the third step in improving our curriculum; namely, the incorporation of three divisions, divided as follows: The Trade High School Division, which requires 2300 hours of trade training work, plus the completion of two years of English and mathematics, one year of applied laboratory science, and one year of social science. This course is noncollege preparatory. Graduates of this division are eagerly sought for and placed in industry as advanced apprentices, generally receiving credit on their indenture, others going as special learners in the technological fields.

In the Technical High School Division boys place greater emphasis on academic preparation than on vocational preparation. In fact, many boys who choose their courses wisely may complete a college preparatory course, together with the vocational training they receive which involves six semesters or approximately 1000 hours of vocational training. Many of the students in the upper third of their class in this division go on to engineering school and some are placed in industry as special technicians.



The patternmaking shop

The machine shop

In our so-called Pre-Engineering Course, we incorporate all of the trade training work that is done in the Trade Division, together with the academic program of the Technical Division. One can readily see that this enriched program requires considerably more time than the courses previously mentioned. The approximate average time is five years of work beyond the eighth grade. Boys finishing this division may also go on to college if they desire.

When a student enters our school, which is during his ninth grade, he is given considerable exploratory work in the vocational fields. In addition, all students are carefully tested so that an intelligent vocational and educational guidance program can be mapped out for all of the boys based upon their abilities and interests. When the student is ready to enter the

tenth grade, he is then advised to specialize in his particular field of vocational interest so that he may, at the end of the twelfth grade, acquire fundamental skills in some one particular crafts field.

The afore-mentioned curriculum can be made flexible enough to meet the needs of all students desiring trade and technical education. There is a program for the slow learner as well as for the fast learner, and we hope, with this newly planned curriculum, to be able to serve all boys who are interested in crafts or technical training.

All A.V.A. visitors are cordially invited to pay us a visit and get firsthand information on the training work done here at the Boys' Trade and Technical High School in Milwaukee.

The automotive shop

Milwaukee's Industrial-Arts Program

ROY A. RADTKE
Supervisor of Industrial Arts
Milwaukee, Wis.

To the members of the A.V.A., and the industrial-arts group particularly, Milwaukee extends a cordial welcome. It is 18 years since you last met in this city, and many changes have taken place in the interim. Generally speaking, Milwaukee is considered a good convention city, and the visitor should find a rich and fertile field for the study of an educational system which does much to foster that which interests the A.V.A. members.

A few notations about Milwaukee may better acquaint you with the civic and educational background of your 1948 convention city.

An Industrial City

Milwaukee is the thirteenth largest city of the United States. During the past 25 years it has doubled in area. Within the past year it has annexed approximately 2000 acres or 3 1/6 square miles of additional land. While many may feel that beer is our most important product, this is not the case. Milwaukee is a highly industrial area, devoted primarily to the production of

Print shop, Kosciuszko Junior Trade School

Grammar school industrial-arts shop

Roy Radtke,
supervisor of industrial
arts, Milwaukee, Wis.

heavy equipment such as overhead cranes, tractors; crushing, mining, and cement machines; gas, steam, and water turbines; industrial refrigerators; steam and gas shovels; heavy storage tanks; auto frames; Diesel engines; and many other products. While most of this equipment is built in large factories employing thousands of men, there are also many small shops employing 50 or less workers. The tool and die industry alone has over 100 plants falling into this latter category. To meet the demands of this great industrial community requires many skilled workers. A survey made a few years ago indicated that approximately 52 per cent of our total population worked in the metalworking industries.

Modern society with its great technological development has its roots in a well-integrated system of public education. The educational facilities in this city are as follows: 93 elementary units; 4 junior high schools, seventh through ninth grade; 4 junior-senior high schools, seventh through twelfth grade; 7 senior high schools, ninth through twelfth grade; 4 junior trade schools, sixth through ninth grade, 2 for boys and 2 for girls; 2 senior trade and technical high schools, ninth through twelfth grade, 1 for girls and 1 for boys; and several special schools for the deaf, cardiacs, etc.

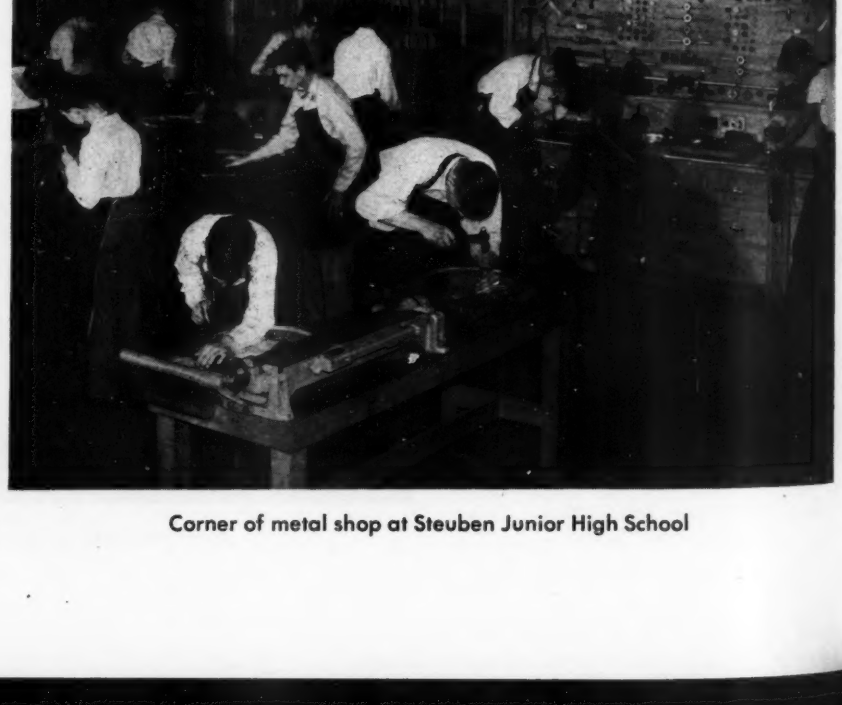
Formal industrial-arts education begins in the seventh grade and continues through the twelfth grade of the cosmopolitan senior high school or the Boys' Trade and Technical High School. It is required in the eighth grade, and elective above that.

Woodwork — 7th Grade, at Walker Junior High School

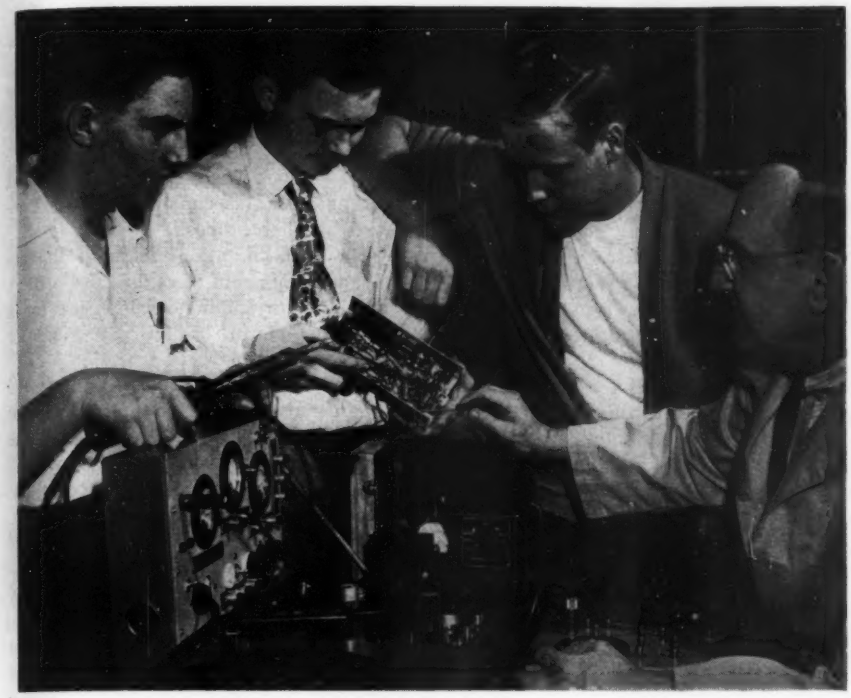
School attendance laws require a boy or girl to attend school until he or she is 18 years of age, although there are provisions for those who, because of economic necessity and a few other reasons, may get a work permit at 16 years. However, in this case he or she must attend the Vocational School at least one day a week until 18.

Personnel

To meet the needs of these various schools, 150 teachers are required, two thirds of whom teach industrial arts, and one third, trade subjects. Their distribution is as follows: 33 are in the grammar grade shops, 12 in the four junior high



Corner of metal shop at Steuben Junior High School



Electronics class at Washington High School

schools, 12 in the two junior trade schools, 10 in the three junior-senior high schools, 32 in the eight senior high schools, and 50 trade teachers in the Boys' Trade and Technical Senior High School. There are approximately 14,000 students in our junior and senior high schools, including Boys' Tech, and 9500 in our grammar grade shops.

Program

The industrial-arts program is identical for all pupils in the seventh, eighth, and ninth grades, except in the junior and senior trade schools, and in a few instances where industrial arts is still offered in the fifth and sixth grades. Since the fifth and sixth graders represent such a small minority, they will not be considered in this article except as a matter of passing information to those who may find some of them in a shop on their visit to one of our schools.

For the majority of our youngsters, then, our program is as follows:

7–B General woodwork, and related drawing
7–A General metals, and related drawing
8–B Electricity, and related drawing
8–A Patternmaking, molding, cement, and related drawing
*9–B Machine woodwork, and mechanical drawing I
*9–A Industrial mechanics, and mechanical drawing II

*In plans for reorganization.

About three years ago, two curriculum directors were employed by the school board, one for the elementary schools and one for the secondary schools. Under their direction considerable progress has been made in revising the whole curriculum. An outline for the reorganization of industrial arts in the senior high schools was recently presented to the curriculum council. Some of the experimental work in connection with this reorganization has already begun, particularly the work in electronics and radio. Much more remains to be done.

For those pupils who find the pattern of the traditional program uninteresting or difficult to master, Milwaukee has established junior trade schools. These schools are prevocational in design, and provide greater opportunities for the individual to explore his mechanical ability and adeptness in a greater number of activities than the regular junior high school offers.

The program provides for ten definite activities. Pupils work in the shop three periods each day, and rotate into a different activity every six weeks. Classes are organized according to ability grouping, rather than chronological age. These junior trade schools are rather unique, and the out-of-town visitor will find them very interesting.

Our Senior Boys' Trade and Technical High School is one of the oldest and one of the finest of its kind in the country. This school ought to be a "must" on your visitation program. Elsewhere in this magazine you will find an article on the senior trade schools, which should better acquaint you with its opportunities and facilities.

Things to See

During the past decade or two, it has been my privilege to visit many cities where I have seen some rather outstanding work. Each of these places had something to offer. It is our hope that you may also profit from your visit with us. Since the program allows for some visitation, it is suggested that you visit at least a grammar grade shop, a junior high school, junior trade school, a senior high school, and the Boys' Trade and Technical High School. It would be rather difficult to anticipate what you are most interested in, but a few suggestions may prove helpful in your observations. In addition to the work in Keene's cement, electronics, electricity, metalwork, woodwork, etc., you may be interested in our method of storing lumber, metal, and projects, of fitting benches with subtops, wood vises with reversible wood jaws, tool benches mounted in the open, bulletin boards, mounted bells and buzzers, and multiple purpose shops. Unfortunately there aren't any shops in the downtown area, but the visitor will most likely find tours arranged for his benefit. Watch for the tour schedule.

This picture, "Confusing," taken by Reed Bethke, Trenton High School student, Trenton, N. J., was awarded a Third Prize of $30 in Class III — Scenes and Still Life — in the Third Annual 1948 National High School photographic awards

Course Building—An Overview

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Intelligent planning is a prerequisite to progress. Such a generalization has numerous ramifications, and perhaps some exceptions, but few will deny the major thesis — intelligent planning must precede and accompany action. This holds true for a nation, a community, a school, an organization, or an individual.

Educationally, such planning (or the lack of it) is reflected in school curriculums and courses of study. Effective teaching and learning require that goals be clearly established, the path to their attainment charted, and methods determined for checking on the extent of achievement. These are the functions of curriculum development and course building. These are factors that must be considered early in any attempt to improve educational outcomes. To be sure, a well-prepared course of study will not automatically result in excellent teaching and learning. It is only a means. The desired end result is a multiplicity of positive changes in the students.

This paper considers the several factors that operate in constructing an effective course of study. An attempt has been made to present graphically and in overview discussion form the step-by-step procedure necessary to the building of such a course. The implications should be equally applicable in the development of a total school curriculum or a single teaching unit.

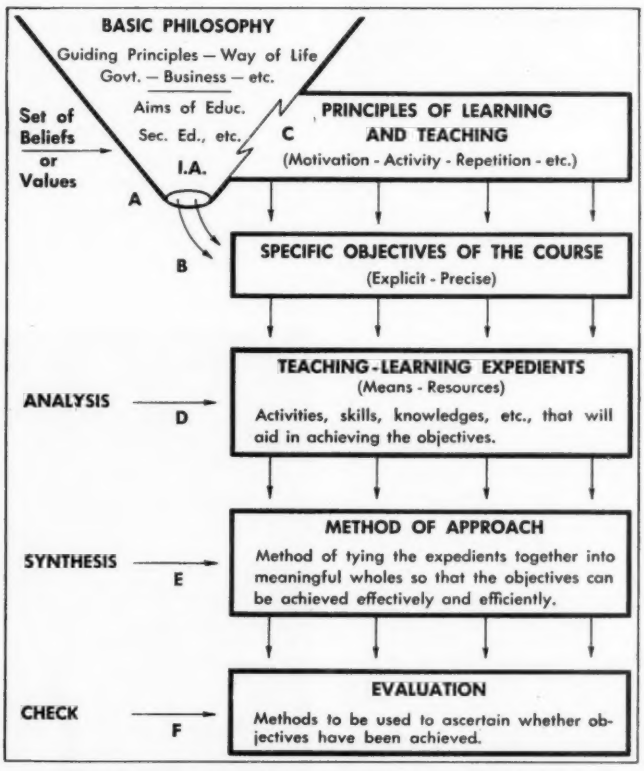

Fig. 1. Diagram of overview in course building

In an effort to clarify and simplify the procedure, it is presented first in graphic form. There are certain limitations to such an endeavor. For example, it is difficult to indicate graphically the interacting nature of the process. Each of the parts must be evolved without losing sight of the several other phases. This cannot easily be portrayed by simple lines.

With such limitations in mind the accompanying diagram represents the writer's concept of curriculum development for a total school offering, a particular course or a single unit of instruction.

A brief description of each part of the diagram may provide a clearer picture of the process. A logical starting point is the basic philosophy underlying the over-all approach. Every normal human being has a philosophy or set of values, of a sort. Too often, however, these basic beliefs are little more than parroted phrases — indistinct, incomplete, confused, and constantly changing. There is need for clarification, analysis, and organization. This is the first step for any individual or group desirous of appraising or reorganizing an educational program.

Graphically, this process has been portrayed as a funnel (see A in the diagram shown in Fig. 1), the top of which is ever broadening to include all aspects of life and its meaning. The lower part of this imaginary funnel might be likened to a movable, focusing lens. The lens should be considered movable in the sense that it can be focused on very narrow or very broad objects.

For example, suppose this imaginary lens is focused on the secondary school. It should bring into sharp relief the philosophy or set of values that underlie this area of our educational system — education for all, economic efficiency, social responsibility, and the like — together with other basic beliefs that may be necessary to a clear and meaningful concept of secondary education.

In the diagram in Figure 1, the lens is focused on a narrower segment, a single course in the school. The objectives for the specific course should then reflect values from each of the successively broader aspects of our way of life.

Carried to the other extreme the funnel conceivably narrows down to the point of including each of our conscious actions. In terms of a teaching-learning situation we might say that everything we do should be aimed at the accomplishment of one or more goals directly related to a series of progressively broader objectives, based on a clearly defined and established set of values.

Stated in different terms, the intelligent and successful teacher is one who has, first of all, a practical, working understanding of the purpose of education. He knows the *whats* and *whys* in this respect. He has a broad basic philosophy that is at the root of his activities in and out of the classroom. Furthermore, he has an understanding of the objectives of education in a democracy and the part that secondary education (in this instance) has to play in accomplishing the ends. Going one step further, he understands the over-all objectives of his special field and the relationships between this area of the curriculum and the other offerings of the school. These understandings underlie his daily activities in the classroom.

A Logical Approach

The logical approach to the process is to evolve the set of values in precise and explicit form, establish specific objectives in terms of these values, determine the means whereby these objectives can be achieved, and develop methods for evaluating the extent of achievement.

A group of questions similar to the following will be helpful in the process of assimilating or establishing a set of values on which teaching efforts should be based:

1. Why do we have schools?
2. What is the purpose of a democracy?
3. What is the function of the school in a democracy?
4. What is the role of the elementary school?
5. What is the role of the secondary school?
6. How does my area of specialization fit into the total picture?

This list is incomplete, but it is a sample of the type of questions that each teacher should be able to answer in clear, unmistakable terms. The answers need not be entirely original; a great many thoughts have already been expressed on each of these points. However, it is more than a process of listing page and paragraph or writing down the words of an authority. The set of values must be a part of the individual. They must be his own, even though the original ideas may have been borrowed from others.

Unless these beliefs come from the individual they will serve only as window dressing for a confused or distorted interior. This is the predicament of those individuals who *copy* a nicely worded set of beliefs or objectives to serve as the basis for their teaching efforts.

The first major step then in building a course of study is the clarification or establishment of a clear set of values within which the course outcomes fit logically and naturally.

Philosophy, Objectives, and Principles of Learning

On the basis of this broad philosophy the course maker is ready to set forth the specific objectives that he wishes to achieve in a particular course (B in Fig. 1). He states these objectives in precise, explicit terms. They set the sights for the entire course. Everything that is done during the course is initiated because in some way it will help in the attainment of the objectives.

For the purpose here intended it is not necessary to describe the listing of objectives in more detail. However, their importance cannot be stressed too greatly. In carrying out the details of course construction a great deal of care and thought must be given to this step; it is basic.

Closely allied with a working philosophy of education is a practical understanding and application of accepted principles of learning and teaching (activity, motivation, repetition, etc.). As shown at C in Figure 1, the two should be dovetailed together. The one complements the other.

A person may have a functional, well-defined philosophy of education, but unless he understands teaching and learning he will experience difficulty in having his students grow in terms of that philosophy. Likewise, a certain teacher may exhibit wonderful results as far as learning is concerned, but if the student growth is in a doubtful direction many questions might be raised. Both factors should be considered as being fundamental and ever present in a real teaching-learning situation.

It should be clear now that a well-established working philosophy is the foundation upon which a course of study is built. An example may help to illustrate how the principles of learning must likewise be given constant consideration.

Learning requires activity. We learn what we live; we learn to do by doing. This is basic to the learning process. Most, if not all, teachers have heard these words many times. Few are adept at putting them into practice. In too many instances students are still treated as so many blotters soaking up knowledge, skills, and words of wisdom that fall from the teacher's lips. We teach students about the structure and organization of our government and pretend we are teaching them democracy. Little or no attempt is made to let them participate actively. We tell them about co-operation and tolerance but only in rare instances do they have an opportunity to practice co-operation and tolerance to the degree necessary for effective learning. We tell them about the importance of electricity in our way of life but provide few, if any, experiences that aid in an understanding and appreciation of this fact.

The point to this discussion is that the course of study is an excellent starting place for thinking through and outlining the means for putting these principles of learning into practice. Unless they are clearly reflected, the course of study is not apt to be very helpful in achieving the objectives that have been set forth.

With the working philosophy and principles of learning well in mind, and after the objectives have been carefully determined, the next logical step is to determine the means whereby these objectives might be attained.

Teaching expedients (see D in Fig. 1) is the term used to describe the means or resources through which the objectives can be realized. The term *expedient* is used advisedly and with the implication that this part of the course contains a list of means and not just subject matter that is apt to become an end in itself. In a sense it is an inventory of the activities, projects, manipulative skills, related knowledge, references, instructional aids, and any other means that will be useful in achieving the desired ends.

This might be considered as the analysis phase of course of study building, if we use the term analysis in a very broad sense (a certain amount of analysis is also necessary in each of the other phases). The traditional trade and job analysis, with which most industrial teachers are familiar, is useful in listing the skills and related information for a particular area of learning. But analysis, as used here, refers also to the subjective process of determining, developing, or devising the other means and resources that are necessary to the realization of the objectives.

When the objectives have been set forth, and when we have before us the numerous teaching expedients that will be useful in reaching the objectives, we are next confronted with the problem of synthesis — putting the expedients together in the most logical and effective manner. The heading for this step has been called the *method of approach*. It is shown at E, in Figure 1. It is here that the teacher thinks through and then describes briefly how each part of the course will proceed from beginning to end. It is in this aspect that many courses of study are weak or fall down completely.

Especial attention must be paid to the principles of learning at this point. For example, we know that interest is essential

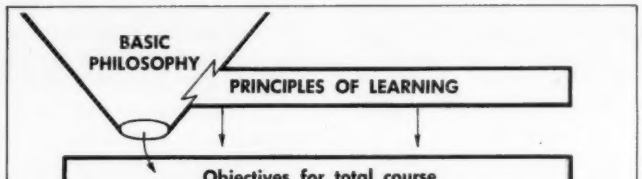

Fig. 2. Diagram showing how a course is divided into units

to effective learning and that the students must be motivated. How to do it is considered in the method of approach. In like manner the other principles of learning must be given cognizance as the teacher thinks through the manner in which the teaching expedients will be combined and presented in order to attain the objectives as effectively and efficiently as possible.

This is the most difficult step in building a course of study. It takes time. It demands thought. It is a process of synthesizing, of putting together, of getting a clear perspective of what will be done throughout the entire course.

When the objectives have been established, the teaching expedients selected, and the method of approach determined, there is still one important phase to be considered. This is the *evaluation* phase (F in Fig. 1), the devices to be used in determining the extent to which the objectives have been realized. Too often, evaluation is a *tacked on* process that consists entirely of giving pencil and paper tests. It must be considered as an integral part of building a course of study. It is much broader than pencil and paper tests — observation, student evaluation, oral reports, written assignments, checking plans, and the like.

One method of insuring proper attention to evaluation is to consider it as a part of the method of approach. When this is done consideration is given to the methods for evaluating the extent to which each activity contributes to a realization of the course objectives. It is a healthy basis for the improvement of instruction.

In concluding this brief "bird's-eye" view of course construction, two points should be re-emphasized: (1) these several phases or steps should be considered as closely knit, integral parts of a course of study, and therefore, (2) as work progresses on each phase it must be with the whole picture in mind.

A further point is also necessary for those readers who have visualized this process as an unwieldy one with page after page of complex details. Break the course up into units, parts, or subdivisions. This same outline will apply equally well to a daily lesson or to a total school curriculum. Perhaps this can be made clearer with the summarizing diagram shown in Figure 2, in which a course is divided into several teaching units.

How Much College Credit For Trade and Industrial Experience?

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The training of teachers of vocational trade and industrial education is a function delegated to each state by the Smith-Hughes Law of 1917. The law stipulates that a program of teacher training must be provided by each state in order to participate in the provisions of the law and other legislation for the promotion of vocational education.

The persons employed as teachers of vocational trade and industrial subjects have to meet exacting trade qualifications, involving a definite number of years of experience together with the necessary skills and knowledge so that they may demand the respect of men in their fields. The trade teacher must secure, in addition to his trade training, a certain amount of professional training. This additional training can be secured through in-service or preservice training programs. These programs are conducted usually on the college level by staff members of an institution approved to give teacher training and frequently college credit is given.

Several colleges and universities throughout the United States evaluate trade and industrial experience in terms of college credit. With this in mind, a trade teacher desiring work leading toward a degree, quite often petitions an institution, which has no plan, to evaluate his trade experience in terms of college credit as part of the course requirements covering a trade and industrial education major. This situation presents certain problems of evaluating trade experience in terms of college credit and necessitates the development of a plan of evaluation that will not lower the standards of an institution nor lessen the value of the degree, but will, at the

same time utilize fully the practical experience of students in their preparation as teachers.

A study of this problem, the evaluation of trade experience in terms of college credit, was made by the writer[1] last year, and a compendium of the study follows:

Historical Review

A historical review of the literature on the subject revealed that a study was made by Siedle[2] in 1930 at the University of Pittsburgh. This study was published the same year as Federal Board Bulletin No. 152. Siedle's study dealt with practices in industrial teacher-training institutions granting college credit for trade, teaching, supervisory and administrative experience in the field of vocational trade and industrial education. Siedle found only one institution, Colorado Agricultural College, with a definite plan for the evaluation of all three phases. He further found that five institutions allowed credit for experience equivalent to the shop and drawing requirements, and that eight institutions had some form of trade test for evaluating trade experience in terms of college credit. The latter institutions probably permitted nothing more in the way of credit than the maximum permitted by credit examinations. Siedle concluded that eleven institutions had granted credit for successful shop-teaching experience, in lieu of observation and practice-teaching courses. He also found that very little thought had been given to the evaluation of supervisory and administrative experience in vocational education for college credit.

Selection of Reporters

In the present study, state supervisors of vocational trade and industrial education in the 48 states were first contacted to determine the institutions that had been approved to offer a major, or a degree in the field of vocational trade and industrial education, and to determine the names of the men in charge of teacher training at these institutions.

Separate questionnaires which differed according to the responsibilities of the two groups, were developed and forwarded to state supervisors and teacher trainers. The returns indicated that the majority of both groups were vitally interested in the problem, and that in a number of states, plans for the evaluation of trade experience in terms of college credit had been developed and were in use.

Returns and Follow-Up

Of the 48 state supervisors, 36 or 75 per cent responded to the first letter and questionnaire. A second follow-up letter brought eight additional replies, making a total of 44 or 91.67 per cent.

Sixty-nine teacher trainers were contacted, and of this number 41 or 59.4 per cent replied to the first letter and questionnaire. A follow-up letter brought 14 additional replies, making a total of 55 or 79.7 per cent.

Results of Study

The conclusions drawn from the replies follow:

1. The majority of the state supervisors and teacher trainers of vocational trade and industrial education advanced the opinion that institutions offering a major or a degree in the field of trade and industrial education should take full cognizance of the value of trade and industrial experience in developing trade teachers, and that these teachers should have their experience evaluated in terms of college credit.

2. A majority, 24 or 58.54 per cent of the 41 teacher trainers, favoring an organized plan for evaluating trade and industrial experience in terms of college credit, indicated that they now have plans for such evaluation, and that these plans have been in effect for periods ranging from 1 to 22 years.

3. The majority of the 29 teacher trainers responding to a list of reasons as to why a plan should be developed, checked one or more of the following reasons:

a) To encourage professional growth.

b) To recognize the fact that trade experience, in certain of its aspects, is comparable to college shop training.

c) To meet the demands of in-service trade and industrial teachers for the recognition of their trade experience in terms of college credit.

4. The average number of years of trade experience required before college credit would be allowed was given as 4.77 years, with a range of from two years on the apprenticeship or learning level to seven years or the equivalent of three years of journeyman experience. This group indicated that the amount of credit should be determined by written, oral, and performance examination.

5. The maximum number of semester hours to allow for trade experience, as indicated by teacher trainers and state supervisors, was 30.93.

6. In addition to apprenticeship and journeyman experience, the following types of experience, according to the respondents, should be evaluated in terms of college credit, but only when the experience is directly in or closely allied to the trade or industrial occupation in which the teacher is seeking credit:

a) General industrial experience.

b) Vocational technical experience. (Experience that does not require an engineering degree but does require a practical application of the laws of science together with the technical knowledge and skills involved. As for example, the experience of an inspector, or an electronic controls technician.)

c) Plant instructor or employee trainer experience.

d) Experience as manager of an industrial establishment.

7. The majority of both groups were of the opinion that trade school and indentured apprenticeship training as well as journeyman experience should be evaluated in terms of college credit, but only upon the condition that the candidate successfully passes written and performance examinations.

8. Credits earned through trade and industrial experiences should be substituted for shop and drawing courses, when substitution is necessary; but a curriculum carrying a trade major, or one permitting sufficient electives for which trade credits can be used, should be provided.

9. The quality and the quantity of trade and industrial experience can best be determined through trade tests, interviews, and affidavits. The trade tests should be of both the written and performance types.

10. Teacher trainers in determining trade proficiency expressed no appreciable difference in their selection of the following types of examining committees:

a) A committee selected under the direction of the industrial education staff at the institution.

b) A committee selected under the direction of the state supervisor of trade and industrial education, and the head of the department of industrial education at the institution.

c) College accrediting committee.

Several respondents strongly recommended that labor and management be represented on the committee for the preparation, administration, and evaluation of the tests.

11. A fee should be charged for the tests to cover the minimum expenses involved.

12. The following reasons for supporting or defending a program for evaluating trade and industrial experience in terms of college credit were presented to and ap-

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[1] *College Credit for Trade Experience*, Unpublished Thesis, Louisiana State University, Baton Rouge, 1947.

[2] Siedle, Anthony Theodore, *Present Practices in Vocational Industrial Teacher-Training Institutions of Granting College Credit for Trade Experience, For Teaching Experience in Trade Schools and for Supervisory and Administrative Experience in Vocational Education*, Federal Board for Vocational Education, Bulletin No. 152, Trade and Industrial series No. 43, Washington, D. C., 1930.

proved by teacher trainers and state supervisors of trade and industrial education:

a) A skilled tradesman with one year of journeyman experience has acquired a broader background of knowledge and skill of the trade than would be possible for him to acquire in the average school shop.

b) Since one year of trade experience, on the journeyman level, is the minimum approved by the U. S. Office of Education for teachers of vocational shop subjects, it seems reasonable to recognize its value and evaluate this experience in terms of college credit.

c) In such teaching fields as English or physics, competency in the subject matter is obtained in college during the student's four years of study. Since trade and industrial teachers need trade and industrial experience to become proficient in their subject, such experience should be evaluated in terms of college credit.

13. It was recommended by the respondents of this study that successful teaching experience in trade schools be evaluated in terms of college credit in lieu of the formal observation and practice teaching requirements of the institution and the state.

14. Responses from the teacher trainers and state supervisors of vocational trade and industrial education would not lead one to conclude that supervisory or administrative experience should be evaluated in terms of college credit.

The responses to the study would seem to indicate that it is not desirable nor should it be required that a teacher of shop subjects pursue credit in shop courses in which he already possesses sufficient skill and knowledge. This is especially true of teachers of vocational shop subjects who have already met exacting trade certification requirements, and who are now teaching or have been approved to teach their trade.

A Proposed Curriculum for Trade and Industrial Education Majors

The proposed curriculum herewith presented is intended to meet state certification requirements in Louisiana. With minor changes, however, it can be adopted and used by institutions in other states.

Vocational shop teachers pursuing professional subjects to meet state certification requirements may apply these credits towards the degree of bachelor of science in vocational trade and industrial education by following the vocational trade and industrial education curriculum. The curriculum is as follows:

	Sem. Hrs.
General Education	
English	12
Social science	12
Science	12
Mathematics	6
Health and Physical Education	
a) Activity courses	4
b) Professional courses	4
Professional (Trade and Industrial) Education	
*Vocational education, 53 (introduction to trade and industrial education)	3
Vocational education, 55 (safety and industrial hygiene)	2
*Vocational education, 79 (principles of teaching)	3
*Vocational Education, 83 (occupational analysis)	3
*Vocational education, 93 (management of vocational industrial shops)	3
*Vocational education, 96 (testing in trade and industrial education)	2
*Vocational education, 118 (observation and practice teaching)	4
***Trade Major or Shop and Drawing*	
Drawing	6
Trade major or shop and related courses	32
Approved electives	36
Total required for degree	144

A Plan for Evaluating Trade and Industrial Teaching Experience in Terms of College Credit

Who Can Petition? Only employed teachers of vocational trade and industrial education, and tradesmen preparing to teach, who have had at least two years of experience on the journeymen level, and who have been approved for trade teaching by the Vocational Trade and Industrial Division of the Louisiana State Department of Education, may petition Louisiana State University for trade credit.

A teacher or tradesman from out of the state must present evidence that he has been approved to teach his trade in his state.

Before a student can petition the institution for trade credits, he must have a total of 36 semester hours of residence credit approved by the department of industrial education.

Release of Trade Credits. The credits earned by examination will be held in escrow until the student has reached junior standing, at which time the credits will be released to apply toward the fulfillment of the requirements for the degree.

University Requirements. Students desiring to follow the vocational trade and industrial curriculum must conform to all university requirements regarding entrance, number of semester hours required, and the grade points or quality of work. Students taking the trade examination must make a grade of *C* or better to qualify for college credit.

Credit for Teaching Experience. Four additional semester hours of college credit may be obtained for a minimum of three years (27 months) of successful teaching experience to meet the university curriculum and state certification requirements for practice teaching. The ability of the student to conduct trade classes will be determined by observing his performance as instructor under actual teaching conditions, and his knowledge of the subject by a comprehensive examination.

Procedure in Establishing Trade Credit. If the student claims credit for trade experience, he should first confer with the head of the department of industrial education and secure printed forms for recording the data necessary for a complete evaluation. He should then fill out the forms, in the proper manner, and have the one showing trade experience notarized. He should then return them to the head of the department of industrial education.

After the necessary data has been supplied, the head of the department of industrial education will consider the case and submit his recommendations to the committee on trade qualifications. This committee will consider each individual case, and upon the supporting evidence, accept or reject the applicant's request for a trade examination.

Final permission to take a trade examination rests in the hands of the head of the department of industrial education and dean of the college. After final permission has been granted, the registrar will be notified. The registrar, in turn, will issue an official permit to take the examination.

Following the issuance of this permit, an advisory committee will be selected under the direction of the head of the department of industrial education and state supervisor of vocational trade and industrial education to assist the university in the preparation, administration, and the final scoring and grading of the examination. The advisory committee will include employers and employees in the trade in which the candidate is being examined. The examination, to be conducted at the university, will include oral, written, and performance sections.

Fees. A basic fee of $1 per semester hour (with minimum of $3) will be charged for each credit petitioned. The amount of credit the student petitions will determine the total amount of basic fees the student must pay at the time the official permit is issued. If any charges are made by employers and employees of the trade for developing and evaluating the examination, that expense must be borne by the student.

*Required professional courses for the certification of vocational trade and industrial teachers.

**A trade or shop major in vocational trade and industrial education will ordinarily consist of 32 semester hours of shop and related subjects. However, in the case of a thoroughly competent and experienced trade teacher, a maximum of 32 semester hours will be allowed upon successfully passing a comprehensive trade examination given by the Department of Industrial Education. These trade credits can be used only on a bachelor of science degree, and cannot be transferred to another institution until the requirements for this degree have been completed.

Co-operation of Industry and Education

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St. Louis, Mo.

The latest trend in the instruction of industrial and technical education is to have the teachers in these fields return to industry, at various intervals, and obtain actual industrial working experiences. These experiences are to be transferred to school instruction, as far as possible, to help better prepare the student to hold his place in industry. With the co-operation of industry and education, the schools are in a position to make a better showing of the taxpayer's money.

Ever since the summer of 1943, The Chrysler Corporation, Detroit, Mich., has been working with school administrators, specialists in education, and teachers for the advancement of education in the United States. Under the excellent leadership of John M. Amiss, director of industrial education, Chrysler Corporation, Detroit, Mich., close to 400 administrators, specialists, and teachers have been able to take advantage of this rare opportunity.

In this program University of Michigan, Northwestern University, University of Cincinnati, Wayne University, Michigan State College, Central Michigan College of Education, Northern Michigan College of Education, Western Michigan College of Education, and Michigan State Normal have had an active part. Twenty-six states, as far north as North Dakota, as far south as Louisiana, as far east as Massachusetts, and as far west as Arizona have had persons represented on this industrial and educational program.

The educational personnel, associated with this program, also has been quite numerous and varied. There have been superintendents of schools, college professors, deans of colleges, deans of boys and men, deans of girls and women, principals of high and elementary schools, assistant principals of high and elementary schools, directors of guidance, counselors, vocational analysts, co-ordinators, supervisors of industrial arts, supervisors of vocational education, industrial-arts teachers, vocational educational teachers, technical education teachers, general-shop teachers, general educational teachers, metallurgists, rehabilitation agents, welfare workers, psychologists, librarians, and teachers of retail selling, theology, and aeronautics.

During the course of this program students have come from elementary and secondary schools, trade schools, technical high schools, colleges and universities, seminaries, boards of education, hard of hearing schools, Chrysler Corporation schools, hospitals, psychological clinics, state boards of control of vocational education, government reservations, and consolidated and community schools.

A little over fifty teachers, each summer, have been selected from all over the United States, Canada, South America, and India to take part in this program, which has been sponsored by Chrysler Corporation and colleges and universities since 1943. These administrators, specialists, and teachers are provided actual working experiences, and have the opportunity of seeing some manufacturing, machining, and assembling of a finished product. During the same time there is an opportunity of hearing top management discuss current industrial problems. In addition, educators from Michigan and Ohio, and especially the Detroit area, addressed the classes on important topics in industrial education, guidance, industrial psychology, visual aids, industrial health, and safety education.

The Chrysler Corporation is working with the educational institutions, through its administration specialists, and teachers to help develop better initial employees, offer the very much needed work experiences for such educators, and to create the proper attitudes toward industry. The administrators, specialists, and teachers, through such work experiences and knowledge of top management, can do much in getting the truth about big business over to our future citizens.

Administrators, specialists, and teachers who are fortunate enough to have the pleasure of working on such a program have the opportunity of gaining much needed knowledge that can be transferred to others. It is the purpose of the Chrysler program to have the administrators, specialists, and teachers experience the same tasks as the students from the time they leave the school building in search for employment, to doing the actual work in the plant, to leaving the job for some reason or another.

Each administrator, specialist, and teacher has the opportunity of experiencing the following:

The experience of putting one entire day in the personnel office, meeting the requirements of the plant necessary before employment; filing an application for a job, taking a medical examination, receiving a badge, time card, company information on rules and regulations, safety rules, and the final word to go to work.

Experience of punching a time clock, wearing working clothes, remaining on your feet for eight hours doing routine, monotonous operations, getting hands, face and clothes dirty from oils and compounds, carrying a lunch pail, eating from a company lunch cart, or buying box lunches from the corner stores, shop housekeeping in industry, actual receiving a pay check, experiencing the insecurity of employment due to wild cat strikes, strikes called by the union or company layoffs due to shortage of materials.

Experience of seeing workers doing an honest day's work for an honest day's pay, actual contact with industrial workers and top management, getting an overview of the relationships in a large industry both specific and general sections, seeing the relationship that should exist between schools and industrial management, firsthand opportunity of seeing what industry expects of schools, knowing how to create a better relationship between the school, industry, and the general public, and how it takes the full co-operation of all in reaching the objective — the finished product.

During 1947, the year of greatest recorded peacetime steel production, the two-billionth ton of steel of the twentieth century was produced in the United States. The stream of ingots flashed past this milestone without immediate recognition, due to the high rate of operation of furnaces and mills. In a year like 1947, 2.7 tons of ingots are made every second. By the end of October, 1947, the century's total had climbed to 2,043,140,000 net tons of ingots and steel for castings.

Industrial Arts and Vocational Education

John J. Metz, Editor

THE A.V.A. CONVENTION IN MILWAUKEE

Eighteen years have passed since the American Vocational Association met in Milwaukee. But this year this annual convention will again be held here and the dates are November 29 and 30, and December 1, 2, and 3.

It is particularly appropriate to have this important meeting held in the metropolis of the state in which the present program of vocational education in our country was first developed. Doubly appropriate is the fact that Wisconsin is celebrating the centennial of its statehood this year, and since it is quite proud of the vocational education system which it has developed, Milwaukee is more than glad to have the vocational educators of the country come to examine what we have, and to show us what we must do to improve what we are offering to those who attend our schools.

Milwaukee is a good city for this convention. Its school system, with its junior high, senior high, technical high, trade schools, and vocational schools, give the visiting teacher a real opportunity for school visiting. There also are a great many industrial plants, sales agencies, and the like that manufacture and handle the things that teachers of industrial arts and vocational education need and are interested in.

Besides these, Milwaukee also has a large public library, a museum, and several art institutes which are worth visiting. There also are many public parks, the zoo, the conservatory, a long drive along Lake Michigan, all of which may prove entertaining to the visitors.

The strenuous efforts put into the planning of this convention promise the meetings to be outstanding in every way. Do not fail to attend.

On our association news page (22A) will be found a copy of a partial convention program listing a number of speeches and discussions. It may be well to study them. They foretell what the convention has to offer.

THE TEACHER'S ENTHUSIASM

Bulwer-Lytton had this to say about enthusiasm:

"Nothing is so contagious as enthusiasm; it moves stones, it charms brutes. Enthusiasm is the genius of sincerity, and truth accomplishes no victories without it."

Every teacher should study the import of this quotation very carefully. Of course, he ought to change the word *brutes* to something else if he wants to apply Bulwer-Lytton's words to his own work and to his students, but the real meaning of the quotation can be of greatest importance in the life and accomplishments of anyone who has anything to do with teaching.

Not every teacher can have the great satisfaction that Professor Frank Fanning Jewett must have felt when Charles Martin Hall rushed up to him excitedly shouting "Professor, I've got it," *it* meaning the discovery of how to produce aluminum. The fact remains, however, that the enthusiasm of Professor Jewett provided the spark that enkindled Hall's interest and perseverance. Of course, not every student is so thoughtful as to inform his teachers of successes which are really attributable to them. That is quite natural, too, because the human being is ever ready to take credit for a success instead of gratefully sharing it with those who have made it possible.

Unfortunately, there are too many teachers who look upon their work as drudgery that has to be endured. They teach in an uninterested manner and their students receive little or no incentive from them. There is no wonder then that their students take little interest in their courses. This is bad enough in itself, but students develop bad habits in such classes, which they may carry over into their work.

The enthusiastic teacher who knows his subject has the power to carry along students who left to themselves would be abject failures. It is no easy thing to remake such students but the right kind of teacher can do it and many teachers of the right kind have done it.

Practically everyone who is teaching now must admit that in his own school days, yes, even in his college days, he found some teachers who went out of their way to make their courses interesting to their students to the extent that the students voluntarily did exceptional work in their classes.

On the other hand, we can all remember teachers who did little to make our studies easier for us. And we all know teachers who were so uninteresting that students would use their class period as a preparation time for some other study.

To do justice to the student, then, teachers should try to develop enthusiasm for their subject. They should study it carefully so that they have a greater knowledge of it than is presented in the text chosen for the student, so that they can give the student interesting side lights which the textbook does not present. The very fact that few students come back to tell their teachers how much they owe to them, should prompt the teacher to gain satisfaction out of the knowledge of having done his own work well, and that he can point out students who have progressed in certain lines because of what he taught them.

THE DECEMBER, 1948, ISSUE

This issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION completes Volume 37, and it may not be out of order to look over the past ten issues to see just what the magazine offered its readers during 1948.

Probably the first item to note is that Volume 37 contains 422 pages of professional reading matter plus approximately 60 pages of news notes of various kinds. If one remembers that practically all of this material is the product of the outstanding men in our profession, it is plain to see that Volume 37 had much to offer to the teacher in the classroom, the supervisor or director on his job, and to the administrators who are answerable for the work of the industrial arts and vocational education teachers. This material, of course, was of no less importance to those who are in teacher training institutions preparing themselves to teach in the school shops of our country.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION is not unmindful of the debt of gratitude which it owes its authors. It is their work which makes our magazine so valuable to the shop teaching fraternity. With the help of these professional writers our magazine will continue to present a history of what has been done and a continuing picture of what is currently being done.

Some Leaders in Industrial Education

WILLIAM T. BAWDEN
Director of Publications
Kansas State Teachers College
Pittsburg, Kans.

James Huff Stout — (Concluded)

(Continued from page 357 of the November, 1948, issue)

Loss by Fire

On February 2, 1897, a disastrous fire completely destroyed the two adjoining buildings housing the high school and the manual training school. The fire entailed a personal loss upon Mr. Stout of not less than $50,000. This reversal stimulated rather than dampened his ardor. Before the ruins were cold Mr. Stout was waited upon by a delegation of citizens and earnestly requested to erect another building for manual training purposes. He proposed to the city that it should erect a first-class high school building and that whatever sum was invested in such a building he would duplicate in a building for manual training. This offer was gladly accepted by the city and a $60,000 high school building was provided. Mr. Stout not only made good on his offer, but expended more than $100,000 on the new manual training building and its equipment. An additional block of land was secured, and architects drew plans for two new brick buildings. The two buildings were connected by a bridge at the second floor, and the basements were joined by a tunnel. The city issued bonds to pay for the new high school and Mr. Stout provided the funds with which to rebuild the manual training school. Also, an enlarged force of teachers was provided at Mr. Stout's expense to carry on the work in the new quarters.

Although this line of work continued as a part of the public school system and was nominally under the direction of the board of education the annual deficit, amounting each year to many thousand dollars above the amount received by local taxation and from the state school funds, was paid by Mr. Stout personally. Not a dollar of the extra expense for manual training and domestic economy in the schools fell upon the taxpayers, as the records show.

Menomonie was probably the first city in the United States to have a thoroughly organized course of manual training and domestic science, extending from the kindergarten through the high school. The local school system became a subject of study by educators all over the country, and countless numbers made pilgrimages to the city to learn of the Menomonie plan and methods. While the perfecting of the local school system was a matter of great pride and satisfaction to Mr. Stout, he had from the beginning larger plans in view, seeking the betterment of the average school child's opportunities in every part of the country.

Among other projects Mr. Stout wished to do something for the physical well-being of the children in the schools. He was never satisfied to do things by halves, and his next move gave further insight into the comprehensiveness of his plans. In 1901 he erected a building containing a gymnasium and natatorium, and employed two teachers to take charge of a program of physical education open to all pupils in the public schools of Menomonie as well as to those of the Stout Training Schools proper.

This handsome brick building, completely equipped, cost somewhat more than $80,000. This structure brought about another bond of close union between Stout Institute and the city of Menomonie, the first of course being the manual training facilities made possible for the children of its citizens. In this building Mr. Stout provided quarters for the Menomonie Commercial Club to hold its meetings, maintain offices, and carry on its manifold activities. These facilities and the accompanying activities have played an important part in the life of the community. "So diversified and so useful are the functions performed through the use of these facilities that it is certain that the city would not have become the Menomonie it is today without them."

In the educational development of Menomonie, in the various ways mentioned, Mr. Stout invested upwards of $600,000. His benefactions were bestowed without ostentation, and so quietly that they were scarcely comprehended by many people living in his home city. Nor were his efforts confined to the fields of manual training, domestic science, and physical culture. He was deeply interested in all forms of education looking to the advancement of the welfare of the common boy and girl deprived of the advantages of higher education. His ideal was to make the public educational facilities of the highest possible advantage to the masses. For example, he was quite as deeply interested in providing the country boy with proper agricultural training as the town boy with industrial education. He was instrumental in the passage of laws and the adoption of measures for the improvement of the rural district schools. Likewise he was an earnest and efficient worker for the provision of better library facilities for the people, especially those living in the rural areas.

From what has been said it must not be inferred that Mr. Stout was opposed to the development of higher educational advantages, though his attitude toward the colleges was at times misunderstood. He was always in sympathy with their work, but used to say: "There are plenty of men of large means ready and able to give for the maintenance of higher education. What little money I have to give I wish to put into the elementary and secondary field."

During his term in the state senate he was largely responsible for the enactment of a law, passed in 1899, permitting counties to provide training schools for rural school teachers. That same year, largely through sentiment which he had created locally, Dunn County took the initiative in the establishment of a school under this law which was opened in the main building of Stout Institute. In 1902 the county provided a special building for the school jointly with the County School of Agriculture, established in that year in pursuance of a law which Senator Stout also helped to have enacted. Both these schools were the first of their kinds in the state, and their efficient service to the surrounding community have fully verified the wisdom shown in their establishment, a fact further proved by their having been taken as models for many others provided elsewhere. Mr. Stout served as president of the boards of trustees of both schools from their establishment until his death in 1910.

In the State Legislature

Mr. Stout was first elected to the Wisconsin state senate in 1894, and was subsequently re-elected three times. He continued to represent his district in the state senate until poor health compelled him to resign his seat in the summer of 1910.

During practically all his 16 years of service in the senate Mr. Stout served as chairman of the committee on education. This position was accorded to him not because he sought it, but because his associates recognized his special fitness for the position. "It is not too much to say that during that entire period, there was hardly an educational measure of any importance presented in the legislature concerning which Senator Stout had not been consulted before it was presented. He did not always approve of measures concerning the value of which he was consulted, but never discouraged the originator from presenting the measures in the form of bills and having them considered by the legislature. The rather striking fact in connection with this matter was that Senator Stout was not a man who through log-rolling tactics undertook to defeat a measure before the legislature. It came to be known that there was no use in appealing to him to help carry through or defeat a measure by such means. Its intrinsic merit, or lack of merit, was what appealed to him, and his desire was to have these qualities, good or bad, presented clearly for the fair consideration of the members of the legislature."

For a number of years prior to 1903 he was a member of the board of regents of the University of Wisconsin, serving for a time as vice-president of the board. He served as a member of the board of commissioners of the State Historical Library, created by the laws of 1895, and was made its president. He was a member of the executive committee of the State Forestry Association. In 1895 the legislature passed a law under which the Wisconsin Free Library Commission was organized, and he was made the president of that body. He was elected president of the West Wisconsin Library Association, organized in 1898. In 1903 he was a member of the joint committee on forestry and lumber of the legislature, and the same year was appointed a member of the state board of managers for the St. Louis Exposition.

In 1896 Mr. Stout gave to Dunn County the first county system of traveling libraries in the state, consisting of 35 collections, and he maintained these libraries until 1910. He was also a liberal supporter of the state traveling library system, and was one of the trustees of the Mabel Tainter Memorial, in Menomonie, with its fine free library. He was also a life member of the Dubuque Library, and a life trustee of the Finley Hospital at Dubuque, both of which institutions he materially benefited. An offer to build and equip a modern consolidated rural school to be located near Menomonie was one of his latest expressions of interest in general educational advancement. This offer was still pending at the time of his death.

Reorganization in 1903

By the turn of the century it became apparent to Mr. Stout that the opportunity was open for another step forward. The buildings, equipment, and teaching staff provided for manual training and domestic science were not utilized to their full capacity by the existing program. Through frequent conferences with Dr. Harvey he was becoming more and more interested in problems related to the shortage of teachers in these special fields, and the apparent lack of facilities for the preparation of such teachers.

In December, 1902, Dr. Harvey's term of service as state superintendent of public instruction came to a close, and he became available for another assignment. Mr. Stout urged him to take over the active leadership of the program in Menomonie. His experience and background ideally fitted him for the task. "He had had experience in all grades of public school teaching and in the supervision of city schools. In 1899, while state superintendent, he had been appointed by the legislature to investigate and report on industrial education as carried on in this and other countries. In 1901, he was reappointed to continue this investigation and to report on courses of study in manual training, domestic science, and the elements of agriculture." For these and other reasons he was thus especially well prepared to assume the leadership in the development of a program such as that contemplated here.

A Combination Assignment

As the result of negotiations between Senator Stout and the board of education, Dr. Harvey, in 1903, became director of the program of manual arts and domestic science established by Mr. Stout, and he was appointed city superintendent of schools by the Menomonie board of education. In addition, he was named assistant cashier in Mr. Stout's bank, with nominal duties. Thus began under the leadership of Dr. Harvey, with the co-operation of the board of education and the community of Menomonie, and the liberal financial support of Senator Stout, a period of unprecedented educational pioneering.

(To be continued)

Cyanide Hardening

LESTER F. SPENCER
Kensington, Conn.

(Continued from page 361 of the November, 1948, issue)

Operating of a Cyanide Bath

In preparing a new bath, it is best to charge 30 to 45 per cent cyanide mixture allowing it to fuse. It is wise to use a metal cover over the bath during all melting or solidification operations. After fusion has taken place, another 30 to 45 per cent cyanide mixture is added. It is to be remembered that in the operation of cyanide baths, the operator should be protected by safety goggles or face mask and have available at all times a pair of asbestos gloves.

Spattering, splashing, and burns, all are potential hazards when using a liquid cyanide bath. Both burns and splashing may be eliminated since they both are usually the results of careless handling. Spattering, on the other hand, results whenever volatile or reactive material is introduced into the molten bath; thus, moisture in any form must not enter the bath, since the steam generated violently expels a large quantity of the molten salt from the pot. In the heat-treat shop, it is usual practice to have salt tempering baths, the salts usually being nitrates or nitrate nitrite mixtures. These oxidizing mixtures react explosively with cyanide and under no circumstance should these nitrates be introduced into the cyanide bath.

The cyanide bath usually is operated intermittently for small batches of work. In the smaller furnace, it is best to allow the salts to freeze thus avoiding unnecessary loss of cyanide and fuel. However, in a furnace which does not melt from the top to the bottom, it is best to put a cast iron wedge in the center of the pot before the salt freezes. The tip of the wedge should

touch the bottom of the pot, while its base should extend some 4 inches above the bath surface. Before remelting the wedge is removed, leaving an opening in the solid salt. On heating, the gases are released through this opening and the melted salt expands into the cavity. The wedge must not be removed until the bath has completely solidified, otherwise there may be a sudden eruption of the molten bath as the wedge is being loosened. In the large installations of cyanide baths, the furnace is permitted to idle at a temperature which is low enough to keep cyanide decomposition at a minimum, but high enough to maintain the bath in a molten state.

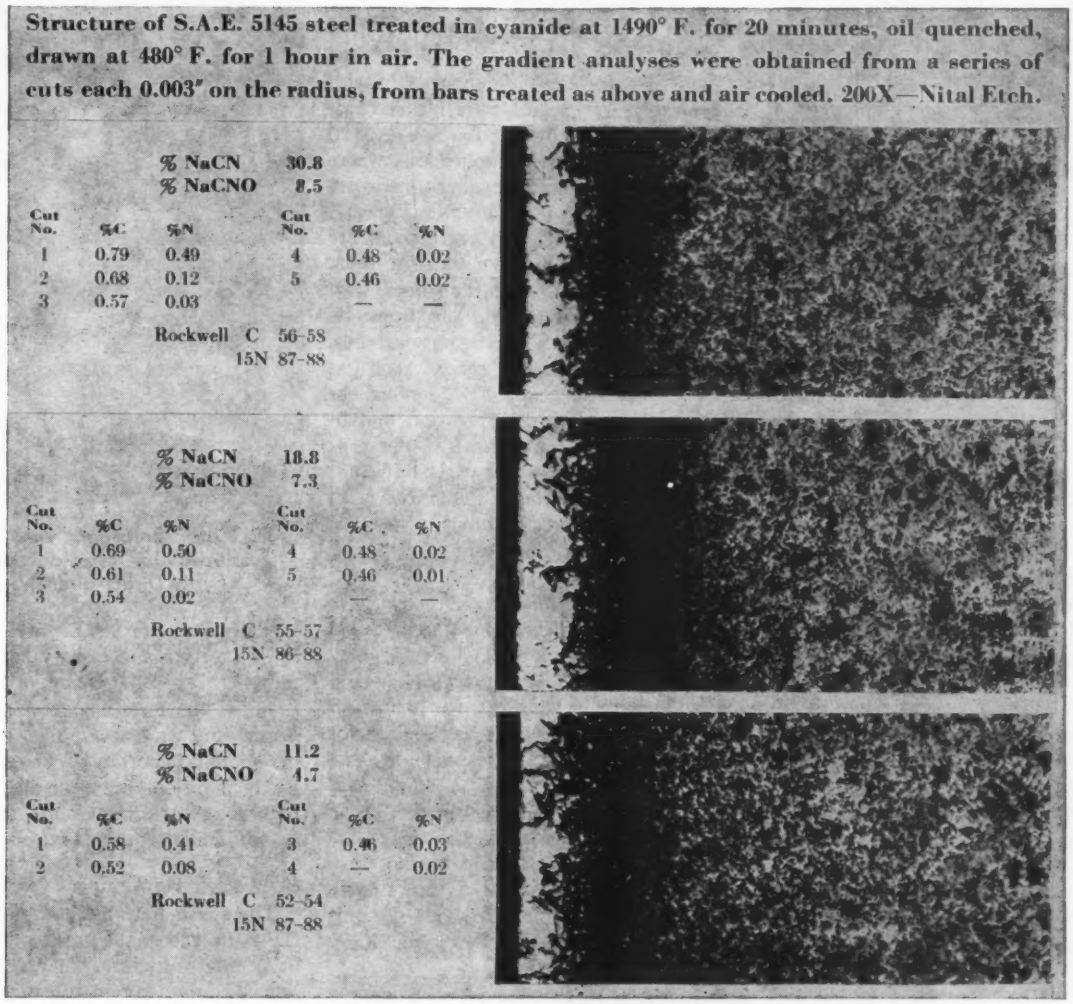
It is customary to bail out some of the old bath before placing the additions so that overflow does not result. This is sometimes necessary in cases where both volatilization and dragout is low or both decomposition high. If dragout and volatilization losses are high or bath decomposition low, it may be necessary to replenish with a cyanide compound less concentrated in cyanide. Thus we may add any one of the following:

1. Sodium cyanide 96 per cent NaCN
2. Cyanide chloride mixture 75 per cent NaCN
3. Cyanide chloride mixture 45 per cent NaCN

Quenching is done directly after immersion in the molten cyanide and sections can be quenched either in oil, water, or brine. In any event, the quenching speed should equal or exceed the critical cooling rate to obtain the desired hardness; however, a too excessively fast cooling rate will promote too much retention of austenite. Brine quenching is preferred over water, since it does not tend to form soft spots. The brine usually is a 5 to 10 per cent solution either of common salt, caustic soda, or sodium cyanide.

Cyanide cases are used wherever there is an application which requires a hard, wear-resisting surface. It is usually applied to gears, screws, bolts, nuts, etc., but of late it is being used for such applications as heat-treating of malleable iron and high speed steels.

Structure of S.A.E. 5145 steel treated in cyanide at 1490° F. for 20 minutes, oil quenched, drawn at 480° F. for 1 hour in air. The gradient analyses were obtained from a series of cuts each 0.003" on the radius, from bars treated as above and air cooled. 200X—Nital Etch.



% NaCN 30.8
% NaCNO 8.5

Cut No.	%C	%N	Cut No.	%C	%N
1	0.79	0.49	4	0.48	0.02
2	0.68	0.12	5	0.46	0.02
3	0.57	0.03		—	—

Rockwell C 56–58
15N 87–88

% NaCN 18.8
% NaCNO 7.3

Cut No.	%C	%N	Cut No.	%C	%N
1	0.69	0.50	4	0.48	0.02
2	0.61	0.11	5	0.46	0.01
3	0.54	0.02		—	—

Rockwell C 55–57
15N 86–88

% NaCN 11.2
% NaCNO 4.7

Cut No.	%C	%N	Cut No.	%C	%N
1	0.58	0.41	3	0.46	0.03
2	0.52	0.08	4	—	0.02

Rockwell C 52–54
15N 87–88

Fig. 5. Indicates the relationship between sodium cyanate percentage and carbon concentration

— Courtesy, E. I. du Pont de Nemours & Co., Inc., Wilmington, Dela.

Activated Cyanide Baths

The activated baths were developed to increase the activity of the bath so that both greater depth of case and greater concentrations could be obtained for the same period of time as compared to the old cyanide process. Besides the cyanide, the activated baths use such activation agents as calcium cyanamid, barium cyanide, or special controlling chemicals such as cer-

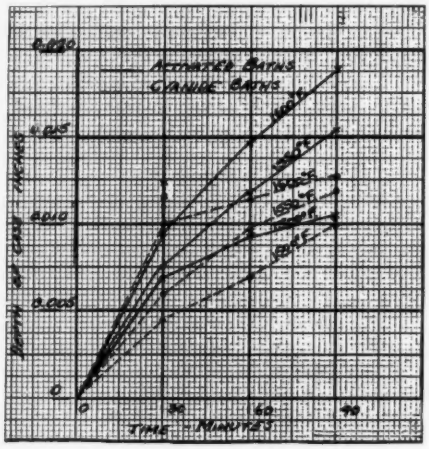


Fig. 6. Comparison of case depth when using activated and cyanide baths (Beckwith)

tain salts of flourides of special calalysts which govern the decomposition of the cyanides.

The temperature of operation is usually from 1500 to 1600 deg. F. The case produced by this bath is less brittle than the straight cyanide case because of the presence of less nitrides. Structure and chemical analysis have found that the case was richer in carbides and has 50 to 75 per cent less nitrides. Figure 6 illustrates the case depth comparison between activated and cyanide baths. This was compiled by Beckwith who has experimented with various activated baths. He had found that there was little variation in results obtained by heat-treating a specific composition steel with both time and temperature constant in six different commercially activated compounds. This was probably due to the fact that a given steel has definite rates of absorption and diffusion at a specific temperature and is not influenced to any great extent by the richness of the carburizing agent at the surface.

Another factor to consider is the type steel that can be used in cyanide hardening. In the plain carbon steels, the standard carburizing steel is one that is generally known as *cold rolled,* having a carbon content of 0.20 per cent and designated as S.A.E. 1020. It is used for wrist pins, camshafts, fan blades, welded tubing, and numerous forged or automatic parts where high strength is not required. Plain carbon steels of lower carbon content can also be used for cyanide hardening; however, it is customary to give these steels a refining heat-treatment following cyanide hardening.

The main alloy steels used for cyanide hardening are as follows:

1. The nickel series which have either 3 or 5 per cent nickel, and carbon from 0.15 to 0.20 per cent, are used where greater strength and toughness are required. In the automotive field, nickel steels of the carburizing grade are used for applications such as ring gears and pinions, countershafts, piston pins, etc.

2. The nickel chromium series which have 1.1 to 3.75 per cent nickel, .50 to 1.75 per cent chromium, and .10 to .20 per cent carbon, also are used interchangeably with the nickel series. The lower nickel chromium series are known as the S.A.E. 3120 steels and are used in applications where greater strength and toughness are required. The higher range of chromium and nickel are the S.A.E. 3310 series and are used in applications where the core must have very high strength and toughness such as is required in rear axle and transmission gears for heavy duty trucks and buses.

3. The molybdenum series such as S.A.E. 4023, 4027, and 4032, having approximately 0.20 to 0.30 per cent molybdenum and 0.23, 0.27, and 0.32 per cent carbon, can all be used for carburizing but not to the extent that is practiced with the afore-mentioned two alloy series. All of these steels are directly quenched after cyanide heating.

4. The molybdenum series may have either chromium, nickel, or both chromium and nickel as alloying constituents along with molybdenum. Thus the S.A.E. 4119 and 4125 have in addition of 0.19 to 0.25 per cent carbon, 0.15 to 0.25 per cent molybdenum, about 1.0 per cent of chromium. S.A.E. 4320 has 1.65 to 2.0 per cent nickel, 4.0 to .60 per cent chromium, .20 to .30 per cent molybdenum, and .17 to .20 per cent carbon. S.A.E. 4615 has no chromium, .13 to .18 per cent carbon, 1.65 to 2.00 per cent nickel, and .20 to .30 per cent molybdenum. The S.A.E. 4815 has an analysis the same as S.A.E. 4615 except that the nickel has increased 3.25 to 3.75 per cent.

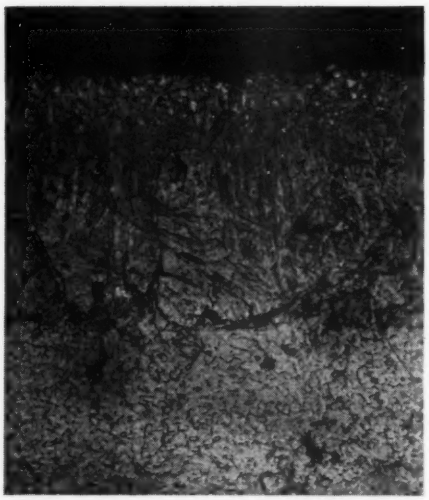


Fig. 7. Photomicrograph of cyanide case 203 in. deep

Fig. 7A. Enlarged view of case produced by cyanide hardening. Direct quench

All of the foregoing steels are used for heavy duty work where high strength is of paramount importance. Those steels with nickel additions are generally used where high fatigue resistance and toughness are an additional requirement.

Hardening Cycles

There are four methods used commercially to check the results of a cyanide hardening procedure. They are as follows:

1. The most common test is the use of a hardness tester such as the Rockwell, Vickers, or Brinell testing machine.

2. Where the size is sufficiently large a second test can be employed which will give an indication as to the depth of case. This test consists of fracturing the section, heat tinting or etching the fracture in 4 per cent nital* after rough polishing on emery cloth. Experience will determine the amount of polishing necessary.

3. Both the third and fourth test is used where proper facilities are available. The third test comprises a carbon check where a round bar is cooled slowly after cyaniding and a series of cuts are taken, each .004 inches deep. A carbon check is then obtained. This test is illustrated in Table 1 where both carbon and nitrogen were de-

*4 per cent nital consists of 4 c.c. nitric acid to 96 c.c. of alcohol.

termined. The fourth test comprises the use of the microscope to determine case depth.

This method, which isn't too common, is an accurate method of determining the depth of case and also approximately the surface concentration of carbon. Figures 7 and 7A are typical photomicrographs of cyanide cases.

There are various cycles used in cyanide hardening. They may be roughly divided into three classes namely:

1. A direct quench from the bath where refinement of either the case or cone is unnecessary.

2. A single reheat for either the case or the core after cyanide treatment to improve properties of either the case or the core.

3. A double reheat, one for the case and the second for the core after cyaniding to improve the properties of both the case and core.

Typical heat-treat cycles are as follows:

A. Material: S.A.E. 1010, 1015, or 1020.
Size: Round bar ⅜ by 3 in.
Treatment: 1) Heat in cyanide 1650 to 1700 deg. F. for ½ hour.
2) Quench in water or brine.
3) Rockwell to obtain *as quenched* hardness.
4) Draw at 275 to 325 deg. F. for 1 hour.
5) Rockwell to obtain *as tempered* hardness.
6) Fracture bar and obtain case depth.

B. Material: S.A.E. 1010, 1015, or 1020.
Size: Round bar ⅜ by 3 in.
Treatment: 1) Heat in cyanide 1650 to 1700 deg. F. for ½ hour.
2) Cool slowly.
3) Reheat to 1400 to 1450 deg. F. for refinement of case. Cyanide can be used and the time should be about 5 minutes.
4) Quench in brine or water.
5) Rockwell to obtain *as quenched* hardness.
6) Draw at 275 to 325 deg. F. for 1 hour.
7) Rockwell to obtain *as tempered* hardness.
8) Fracture bar and obtain case depth.

C. Material: S.A.E. 1010, 1015, 1020.
Size: Round bar ⅜ by 3 in.
Treatment: 1) Heat in cyanide 1650 to 1700 deg. F. for ½ hour.
2) Cool slowly.
3) Reheat to 1650 to 1700 deg. F. for refinement of core.

Cyanide can be used and the time should be about 5 to 7 minutes.
4) Quench in oil or water.
5) Reheat to 1400 to 1450 deg. F. for refinement of case.

Here cyanide can also be used with the time approximately 3 to 5 min.
6) Quench in water or brine.
7) Rockwell to obtain *as quenched* hardness.
8) Draw at 275 to 325 deg. F. for 1 hour.
9) Rockwell to obtain *as tempered* hardness.
10) Fracture bar and obtain case depth.

The above three are typical heat treatments that can also be practiced with the low alloy steels. To save repetition, the heating temperatures and quenches used in hardening these alloy steels are as follows:

1. Nickel series — S.A.E. 2317
Cyanide hardening — 1650 to 1700 deg. F.
Quench after cyanide — Oil or slow cool
Core refinement — 1450 to 1500 deg. F.
Case refinement — 1350 to 1400 deg. F.
Quench used after reheats — Oil
Drawing temperature — 250 to 300 deg. F.

2. Nickel series — S.A.E. 2515
Cyanide hardening — 1650 to 1700 deg. F.
Quench after cyanide — Cool slowly
Core refinement — 1400 to 1475 deg. F.
Case refinement — 1325 to 1375 deg. F.
Quench used after reheats — Oil
Drawing temperature — 250 to 400 deg. F.

3. Nickel — chromium series — S.A.E. 3115, 3120, and 3310
Cyanide hardening — 1650 to 1700 deg. F.
Quench after cyanide — Slow cool or oil
Core refinement — 1450 to 1500 deg. F.
Case refinement — 1375 to 1425 deg. F.
Quench used after reheats — Oil
Drawing temperature — 250 to 300 deg. F.

4. Molybdenum series — S.A.E. 4023, 4027, 4032
Cyanide hardening — 1650 to 1700 deg. F.
Quench after cyanide — Oil
Draw temperature — 250 to 300 deg. F.
This series not usually reheated after cyaniding.

5. Molybdenum series — S.A.E. 4119, 4125, 4615, 4320, 4815.
Cyanide hardening — 1650 to 1700 deg. F.
Quench after cyanide — Oil or cool slowly
Core refinement — 1450 to 1500 deg. F.
Case refinement — 1350 to 1400 deg. F.
Quench used after reheat — Oil
Drawing temperature — 250 to 300 deg. F.

It must be remembered that the effect of the refinement heat treats can be quantitatively measured by the use of the microscope and the improvement of the properties can only be determined by service.

Refer again to the data sheet prepared by E. F. Houghton & Co., which is reproduced at the beginning of this article. The rules laid down in this sheet must be rigidly observed.

This picture, "Felicity," taken by Richard Santuci, Buffalo Technical High School student, Buffalo, N. Y., was awarded a second prize of $50 in Class V — Babies and Small Children — in the Third Annual 1948 National High School Photographic Awards

Teaching Materials For Industrial Education

CHRIS H. GRONEMAN
Industrial Education Department
Agricultural and Mechanical College of Texas
College Station, Tex.

(Continued from page 366 of the November, 1948, issue; for complete directions when ordering films refer to page 270 in September issue)

Plastics

Boonton Molding Co., 326 Myrtle Ave., Boonton, N. J.
- *Shape of Things to Come* — 16mm. — sound — 34 min.

Catalin Corp., 1 Park Ave., New York 16, N. Y.
- *The Production of Catalin* — 16mm. — silent — 400 ft. — color

Celanese Corporation of America, 180 Madison Ave., New York 16, N. Y.
- *Proving Ground* — 16mm. — sound — 25 min.

E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.
- *Facts About Fabrics* — 16 or 35mm. — sound — 26 min.
- *Fashion's Favorite* — 16 or 35mm. — sound — 33 min.

The Formica Insulation Co., Cincinnati 32, Ohio
- *The Formica Story* — sound — 45 min. — color
  (Available only to universities, colleges, clubs, trade associations)

Hercules Powder Co. Inc., Wilmington, Del.
- *Careers for Cellulose* — 16mm. — sound — 30 min. — color

Kansas, University of, Bureau of Visual Instruction, University Extension Division, Lawrence, Kans.
- *Fourth Kingdom* — 16mm. — sound — 3 reels — 50 cents (rental)
- *Rayon* — 16mm. — sound — 30 min. — 50 cents (rental)

Modern Plastics Magazine, 122 E. 42nd St., New York 22, N. Y.
- *The Magic of Modern Plastics* — 16mm. — sound — 40 min. — color
- *This Plastics Age* — 16mm. — sound — 30 min. — color

Monsanto Chemical Co., Plastics Division, Springfield 2, Mass.
- *The Magic of Modern Plastics* — 16mm. — 28 min.

Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.
- *Looking Ahead Through Plexiglas* — 16mm. — sound — 30 min. — partially in color

United States Stoneware Co., P.O. Box 350, Akron, Ohio
- *Tygon* — 16mm. — silent — 14 min. — color

Transportation

Association of American Railroads, Transportation Bldg., Washington 6, D. C.
- *Big Trains Rolling* — 16mm. — sound — color
  (Direct requests to Association Films, 347 Madison Ave., New York 17, N. Y., or to Castle Films, RCA Bldg., 30 Rockefeller Center, New York City; Russ Bldg., San Francisco, Calif.; or Field Bldg., Chicago, Ill.)

Association of Manufacturers of Chilled Car Wheels, 445 N. Sacramento Blvd., Chicago 12, Ill.
- *The Story of the Chilled Car Wheel* — 16mm. — sound — 1200 ft. — 27 min.

Atchison, Topeka and Santa Fe Railway System, 80 East Jackson Blvd., Chicago 4, Ill.
- *Conquest* — 20 min. — 35mm. — sound slide film
- *El Navajo* — 45 min. — 16mm. — color — commentary
- *Navajo Sandpainters* — 22 min. — 16mm. — sound — color — commentary
- *Navajoland* — 10 min. — 16mm. — sound — color — commentary
- *Carlsbad Caverns* — 10 min. — 16mm. — sound — color — commentary; 15 min. — 16mm. — silent — color
- *Grand Canyon* — 22 min. — 16mm. — sound — color — commentary; 12 min. — 16mm. — silent — color
- *Citrus* — 14 min. — 16mm. — sound — color — commentary
- *Welcome to Southern California* — 16 min. — 16mm. — sound — color — commentary; 20 min. — 16mm. — silent — color
- *Glimpses of Old Santa Fe* — 10 min. — 16mm. — sound — color; 15 min. — 16mm. — silent — color
- *Let's See Chicago* — 23 min. — 16mm. — sound — color — commentary
- *Arizona Winter Ranches* — 10 min. — 16mm. — sound — color; 15 min. — 16mm. — silent — color
- *Summertime in Yosemite National Park* — 10 min. — 16mm. — sound — color; 10 min. — 16mm. — silent — color
- *Yes, This is New Mexico* — 10 min. — 16mm. — sound — color; 15 min. — 16mm. — silent — color
- *Winter in the Desert Round Palm Springs California* — 16 min. — 16mm. — silent — color; 11 min. — 16mm. — sound — color
- *Museum and Santa Fe* — 10 min. — 16mm. — sound — color — commentary; 22 min. — 16mm. — silent — color
- *San Diego Zoo* — 12 min. — 16mm. — sound — color — commentary
- *Loaded for War* — 23 min. — 16mm. — sound — color — commentary
- *Operation of A Steam Locomotive* — 15 min. — 16mm. — silent
- *Tank Destroyers* — 23 min. — 16mm. — sound — color — commentary
- *The Time is Now* — 18 min. — 16mm. — sound — color — commentary
- *Stop, Look and Live* — 15 min. — 16mm. — sound — color — commentary
- *Don't Let It Happen To You* — 12 min. — 16mm. — sound — color — commentary
- *Watch Your Step* — 11 min. — 16mm. — sound — color — commentary

Canadian Pacific Railway, Dept. of Public Relations, Montreal, Que., Can.
- *Shining Mountains* — 20 min. — 16mm. — sound — color — 2 reels; 24 min. — 16mm. — silent — color — 2 reels
- *Canada's Tackle Busters* — 20 min. — 16mm. — sound — color — 2 reels; 24 min. — 16mm. — silent — color — 2 reels
- *Down by the Sea* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *Land of Ski Hawks* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *Cruising the Inland Seas* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *From Coast to Coast* — 30 min. — 16mm. — sound — color — 3 reels or silent
- *Canadian Mountain Summer* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *Riding High* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *The Radiant Rockies* — 20 min. — 16mm. sound — color — 2 reels; 24 min. — 16mm. — silent — color — 2 reels
- *Alaska and the Yukon* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *Winter Playground* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *Skiing in the Laurentians* — 10 min. — 16mm. — sound — color — 1 reel; 12 min. — 16mm. — silent — color — 1 reel
- *Hiking on Top of the World* — 12 min. — 16mm. — silent — color — 1 reel
- *Trail Riding Through the Clouds* — 24 min. — 16mm. — silent — color — 2 reels
- *The Maritimes* — 12 min. — 16mm. — silent — color — 1 reel
- *Summer Idyll* — 12 min. — 16mm. — silent — color — 1 reel
- *Snow Hills of Quebec* — 12 min. — 16mm. — silent — color — 1 reel
- *Sunshine Skiing* — 12 min. — 16mm. — silent — color — 1 reel

Chicago, Rock Island and Pacific Railway Co., Public Relations Dept., 139 West Van Buren St., Chicago 5, Ill.

Colorado — Vacationland Supreme — 16mm. — silent or sound — 2 reels — 30 min.

Educational Film Service, 180 North Union St., Battle Creek, Mich.

Post Office — 16mm. — silent — 15 min. — $1 rental

General Electric Co., 1 River Road, Schenectady, N. Y.

Railroadin' — 28 min. — 16mm. — sound

Great Northern Railroad, St. Paul 1, Minn.

(The following films may be obtained direct from the Princeton Film Center at Princeton, N. J.)

Empire on Parade — 16mm. — sound — 1 reel — 35 min. — color

In All the World — 16mm. — sound — 1 reel — 35 min. — color

Ideal Pictures Corp., 28 East 8th St., Chicago, Ill.

Story of Transport and Travel — 16mm. — sound — 4 reels — $6 per day (rental)

Special *Educational Catalog* covering 250 different subjects for general classroom curriculum use

The Jam Handy Organization, 2821 East Grand Blvd., Detroit 11, Mich.

Slidefilms and Motion Pictures to Help Instructors (catalog)

Kansas, University of, Bureau of Visual Instruction, University Extension Division, Lawrence, Kans.

Airplane Changes Our World Map — 16mm. — sound — 1 reel — $1.50 (rental)

Airplane Trip — 16mm. — sound — 1 reel — $1.50 (rental)

Boat Trip — 16mm. — sound — 1 reel — $1.50 (rental)

Canals of England — 16mm. — sound — 2 reels — $3 (rental)

City Bound — 16mm. — sound — 1 reel — $1 (rental)

Construction of a Light Airplane — 16mm. — sound — 3 reels — 50 cents (rental)

Development of Transportation — 16mm. — sound — 1 reel — $1.50 (rental)

Flatboats — Boatmen of the Frontier — 16mm. — sound — 1 reel — $1.50 (rental)

History of Aviation — 16mm. — sound — 3 reels — $4.50 (rental)

Horses — 16mm. — sound — 1 reel — $1 (rental)

Lubrication — 16mm. — sound — 3 reels — 50 cents (rental)

Lubrication of Gasoline Engines — 16mm. — sound — 2 reels — 50 cents (rental)

Oil fom the Earth — 16mm. — sound — 2 reels — 50 cents (rental); 1 reel — $1.50 (rental)

Petroleum and Its Uses — 16mm. — sound — 4 reels — 50 cents (rental)

Railroadin' — 16mm. — sound — 3 reels — 50 cents (rental)

Roads South — 16mm. — sound — 2 reels — 50 cents (rental)

Sampans and Shadows — 16mm. — sound — 1 reel — $1.50 (rental)

Singing Wheels — 16mm. — sound — 2 reels — 50 cents (rental)

Story of Charles Goodyear — 16mm. — sound — 1 reel — $1.50 (rental)

Synthetic Rubber — 16mm. — sound — 2 reels — 50 cents (rental)

Transfer of Power — 16mm. — sound — 2 reels — $1.50 (rental)

Automobile Lubrication — 16mm. — silent — 1 reel — 25 cents (rental)

Camels — 16mm. — silent — ½ reel — 60 cents (rental)

Drydocking and Repairing Ships — 16mm. — silent — 1 reel — 60 cents (rental)

Horses — 16mm. — silent — 1 reel — 60 cents (rental)

Principles of Flight — 16mm. — silent — 1 reel — 60 cents (rental)

Railroad Safety — 16mm. — silent — 1 reel 60 cents (rental)

Railroad Transportation — 16mm. — silent — 2 reels — 50 cents (rental)

Story of Gasoline — 16mm. — silent — 2 reels — 50 cents (rental)

Story of Lubricating Oil — 16mm. — silent — 2 reels — 50 cents (rental)

Story of a Spark Plug — 16mm. — silent — 2 reels — 50 cents (rental)

Story of a Storage Battery — 16mm. — silent — 2 reels — 50 cents (rental)

Transportation — 16mm. — silent — 1 reel — 60 cents (rental)

Transportation on the Great Lakes — 16mm. — silent — 1 reel — 60 cents (rental)

New York Central System, Motion Picture Bureau, 466 Lexington Ave., New York 17, N. Y.

The Freight Yard — 16mm. — sound — 20 min. — 2 reels

New York Calling — 16mm. — sound — 22 min. — 2 reels — color

The Steam Locomotive — 16mm. — sound

The Railroad Signal — 16mm. — sound — 17 min.

Thundering Waters (story of Niagara Falls) — 16mm. — sound — 21 min. — color

(Above distributed by a large number of local film libraries. Write for full list.)

The New York, New Haven and Hartford Railroad Co., Public Relations Dept., Grand Central Terminal, New York 17, N. Y.

A Great Railroad at Work — 16mm. — 45 min. — (rental)

New England — Yesterday and Today — 16mm. — 20 min. (rental)

This is New England — 16mm. — 20 min. (rental)

Northern Pacific Railway, St. Paul, Minn.

The Trail Leads West — 16mm. — silent — 30 min. — 2 reels — color

Yellowstone Magic — 16mm. — silent — 15 min. — 1 reel — color

Pan American World Airways System, 28–19 Bridge Plaza North, Long Island City 1, N. Y.

Wings to Ireland — 16mm. — sound — 25 min. — color

Wings to Alaska — 16mm. — sound — 25 min. — color

Wings over Latin America — 16mm. — sound — 40 min. — color

Weekend in Bermuda — 16mm. — sound — 15 min. — color

Clippers at War — 16mm. — sound — 45 min. — color

(Films listed above may be secured from official depositories throughout the United States. Please write for list of depositories to Educational Director, Pan American World Airways, 135 East 42nd St., New York 17, N. Y. Films also for sale.)

Pratt and Whitney Aircraft, Division of United Aircraft Corp., East Hartford 8, Conn.

It's Our Job (foremen's training film) — 16mm. — sound — 2-week loan

Society for Visual Education, Inc., 100 East Ohio St., Chicago 1, Ill.

Catalogs of visual aids in all subjects

Transcontinental and Western Air, Inc., Air-Age Education Div., 101 West 11th St., Kansas City 6, Mo.

Winged Horizons — 16mm. — sound — 45 min. — color

Youth Takes to Wings — 16mm. — sound — 55 min.

Trans World Airlanes — 16mm. — sound — 15 min.

United Air Lines, United Air Lines Bldg., Chicago 38, Ill. School and College Service offices at 80 E. 42nd St., New York 17, N. Y.; 35 E. Monroe St., Chicago 3; 6th & Olive Sts., Los Angeles 14; 400 Post St., San Francisco 2; and 1225 — 4th Ave., Seattle 1, Wash.

Slide films available with story handbooks on a free loan basis:

Coast to Coast Geography from the Air — 53 frames (junior and senior high school)

Research Engineering, Aircraft Developments, Airports — 24 frames (junior and senior high school)

Meteorology and Navigation — 24 frames (junior and senior high school)

Global Concepts and the Age of Flight — 24 frames (junior and senior high school)

Seeing the Airport — 33 frames (grades 2–5)

Air Transportation, Jobs and You — 55 frames (junior and senior high school)

Mainliner Meals — 35 frames — technicolor (junior and senior high school)

Motion picture film available on free loan basis:

Of Men and Wings — 16mm. — sound — 18 min.

Wisconsin, University of, Bureau of Visual Education, University Extension Division, Madison 6, Wis.

Airplane Changes Our World Map — 16mm. — sound — 10 min. — $1.25 (rental)

Airplane Trip — 16mm. — sound — 14 min. — $1.25 (rental)

Conquest of the Air — 16mm. — sound — 45 min. — $6.25 (rental)

Flatboatmen of the Frontier — 16mm. — sound — 11 min. — $1.25 (rental)

Great Lakes — 16mm. — sound — 22 min. — $2.50 (rental)

Keeping Your Car Fit — 16mm. — sound — 12 min. — $1.25 (rental)

Know Your Car — 16mm. — sound — 15 min. — $1.50 (rental)

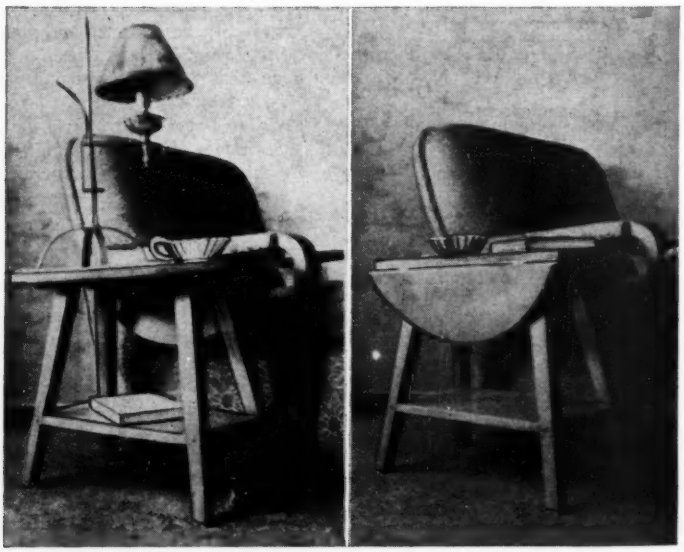
(To be continued)

Problems and Projects

COLONIAL DROP-LEAF TABLE

HAROLD O. AKESON
High School
East Orange, N. J.

Almost every craftsman has the urge, at one time or another, to build a piece of colonial furniture. Some of the drop-leaf tables with turned legs look fascinating, but all colonial furniture did not have turned legs for the simple reason that in the early colonial period machinery in America was not easy to obtain. So the simple lines in furniture design were the order of the day. The popularity of small tables is still the vogue and anyone interested in colonial maple furniture would find this design and construction as simplified as could be desired.



Colonial drop-leaf table

The drop-leaf table featured in this article is well adapted for use as a coffee table, or as an end table. Its straight lines fit with modern furniture as well as in a colonial period atmosphere.

Start the construction by gluing up the stock using a dowel joint for the top and shelf pieces, if lumber cannot be obtained in the specified width. While the glue is drying, square the stock for the legs and plane the taper to size, as shown on the drawing. As the legs are to support the top, it is necessary to drill a 1-in. hole, 1 in. deep, in the large end of each leg for 1-in. maple dowels. If a lathe is available this part may be turned. Be sure to allow for the additional length. Allow enough length to the dowel joint so that it will protrude through the table top to later be cut off and sanded smooth. These dowels should be a good fit and be properly glued as much depends on them.

Next prepare the top which includes the two drop leaves. A paper pattern may be used to be sure that the sides match in laying out the shape. After the transfer of the pattern to the boards, the top is ready to be cut out. Before cutting the elliptical shape of the top, it is best to fit the boards of the top together. This can be done by nailing wood strips in place, on what will be the underside of the table top. The idea being to treat the top as one large surface so that there will be a perfect uniformity of shape all around. Smooth down the edge with spokeshave and plane. Round off the edges of the top slightly.

The next step is to mark the location for the legs on the underside of the top. This has to be done very accurately.

Set up a brace and 1-in. bit for drilling the holes for dowels through the top. This is a very particular job for there are angles in two directions that have to be considered. A single jig, or drill block fitted over the bit, cut at the proper angles, could be made to use when drilling these holes. It would take a little extra time to make but will give one a certain amount of confidence and insure a satisfactory job. Do not let the bit splinter the wood on the other side of the hole. When the spur starts to show, remove the bit, and drill from the opposite side of the piece.

When the holes have been drilled, fit the legs to the table top. Note the rounding of corners at the top end of leg. In order to keep the correct slant of legs, build a frame of strips of wood, nailed to the floor, around the feet to hold the table in place until the glue is dry. Glue the doweled end of the legs into the top. For pressure, set some heavy object on the table weighing approximately fifty pounds.

Prepare the board for the shelf. This part of the job will require careful cutting and fitting. Fasten the legs to the shelf with No. 8 by 1¼-in. flathead bright screw. The hole in the leg will have to be counterbored with a ⅜-in. drill to set the screw ½ in., well below the surface of the leg. All fastenings should be made from the sides rather than the ends. Holes are plugged up with glue and short pieces of ⅜-in. maple dowels. These dowels could be rounded on the outside and allowed to project ¼ in. above the surface of the leg. This would give an effect of being *pegged* furniture.

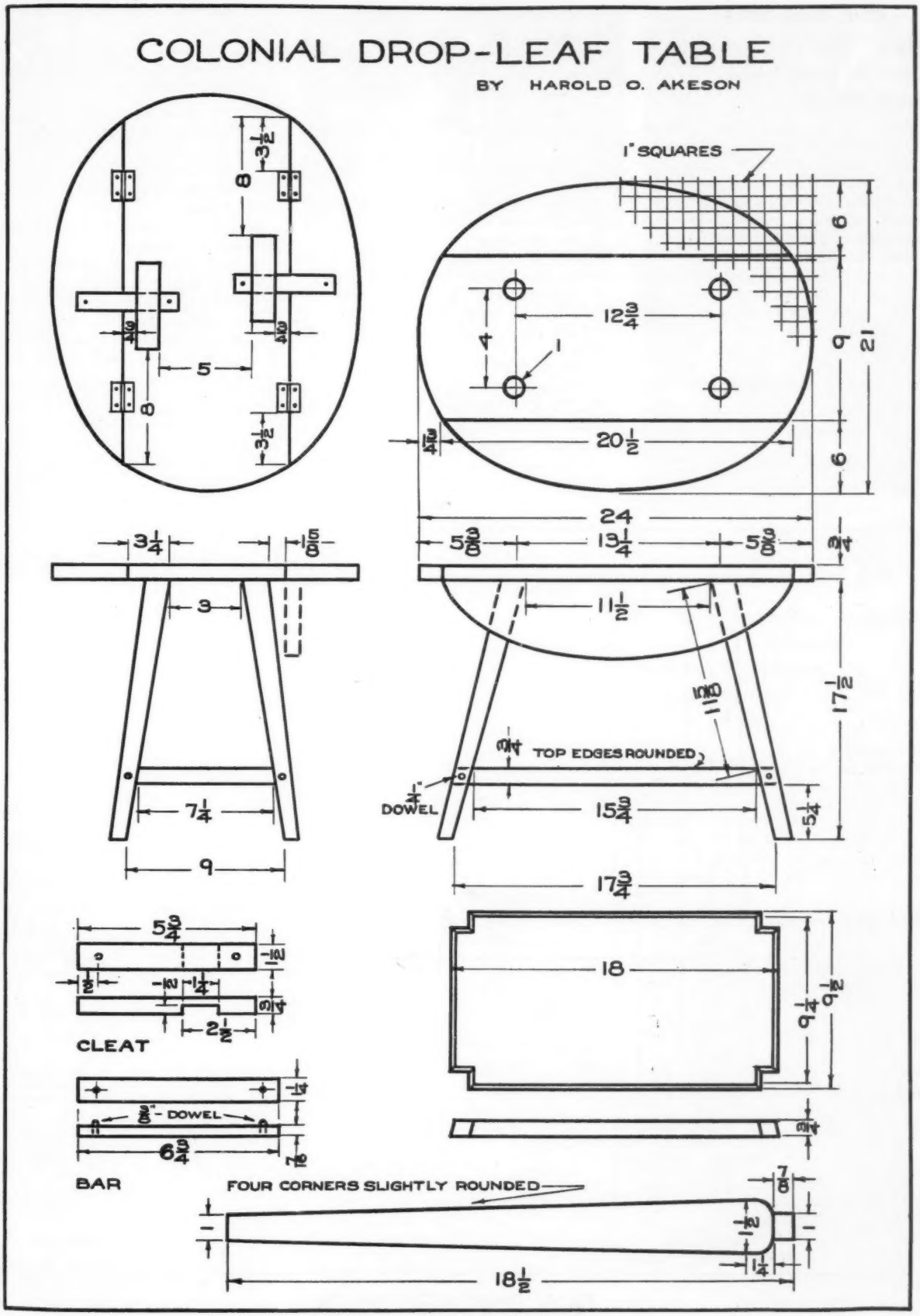
Check the table at this stage of construction, on some level surface, for evenness. If it rocks, locate the faulty legs and correct by cutting off the excess length.

All the parts are finished now except the cleats and bars which support the drop leaves when they are raised. These will not present any difficulty if the specifications of the drawing are followed.

Every part should have a thorough job of sandpapering before assembling. Much depends on that for a good finish.

The table is placed, top down, on a bench for the final assembly of the remaining parts; drop leaves, cleats and bars, and hinges. Carefully lay out the position of the hinges, when the leaves are in place and cut the spaces to take them. Hinges are of brass ½ by 1½ in. Use No. 8 by 1¼-in. flathead brass screws to fasten the cleat to the table. Be sure that the bar moves back and forth freely. The ⅜-in. dowels that are used as stops to keep the bar in place protrude ½ in.

The finish is largely a matter of preference. However, a colonial maple stain goes very well with this piece of furniture. After staining, apply two coats of white shellac. Rub down, between coats, with a very fine steel wool. Apply wax and polish for a final finish.



Details of colonial drop-leaf table

CIVIL WAR RIFLE

GEORGE F. LARTZ

U. S. Grant and Lincoln Schools

Sheboygan, Wis.

Another gun for the model maker's interest is this slender rifle of the Civil War years. The originals shown in Figures 1 and 2 are preserved on the Gettysburg, Pa., and Antietam, Md., battlefields, and played a large part in the offensives staged during this conflict. For realism the cannon should be turned from cold rolled steel, but brass makes the project an attractive mantelpiece. Angle steel mounts are again substituted for the wagon wheels to keep the job almost entirely within the metalworking shop. The model shown in Figure 3 was made to the scale of 1 in. equals 1 ft.

Method of Procedure

Machining trunnions:

1. Mount short scrap stock in chuck or collet.
2. Turn to dimensions, polish, cut off.
3. Reverse stock, face, polish.
4. Set aside to press in barrel later.

Machining barrel:

1. Chuck stock in independent chuck and true up.
2. Center drill, make bore with long set drill, and ream to size.
3. Reverse in chuck and center drill other end.
4. Mount between centers and rough turn cascabel.
5. Offset tailstock according to the details, and turn taper.
6. Face shoulders.
7. With barrel secured in V block lay out positions for trunnions using surface gauge.
8. Drill and ream 3/8-in. holes 1/8 in. deep with a drill especially ground to a lip angle of 80 deg. Start this drill with a shallow 1/4-in. hole first.
9. Center punch and drill fuse hole.
10. Press trunnion pins in place.
11. Chuck in universal chuck, round up cascabel, and polish highly overall.

Machining rifle mount:

1. Cut two lengths angle steel from bar.
2. Lay out to dimensions and rough cut.
3. Mount in shaper vise and make angular cuts to size.
4. Center punch and drill all holes.
5. Drawfile edges and clean off burrs.
6. Paint with flat black.

Making base (woodworking department):

1. Cut 3/4 by 3 1/2 by 6 1/2-in. base of walnut or other hardwood.
2. Plane chamfers.
3. Lay out and drill shallow spots for three 5/16-in. balls.
4. Lay out and drill 7/32-in. holes for fastening rifle mount.
5. Sand smooth, coat with shellac, rub down when dry, and polish with wax.
6. Cut a strip of 20-ga. brass 5/8 by 3 in., and stamp on the words *Civil War Rifle*. Polish plate, and fasten to base with brass pins.

Assembly:

1. Assemble cannon mount and barrel.
2. Fasten to base with four 1/4 by 1-in. lag screws.
3. Pile four 5/16-in. balls in position.
4. Turn in for instructor's grading.

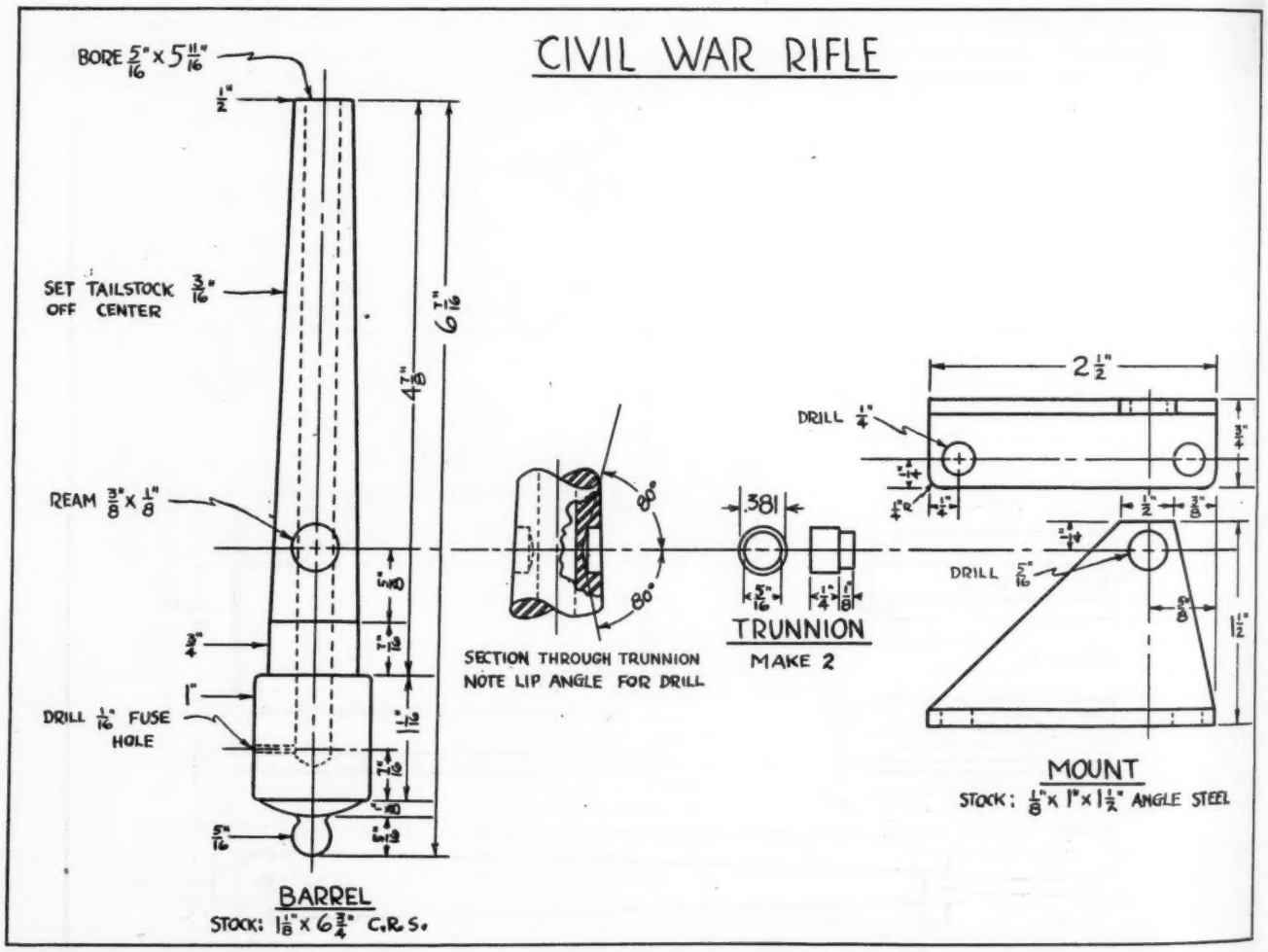


Fig. 4. Details of Civil War rifle

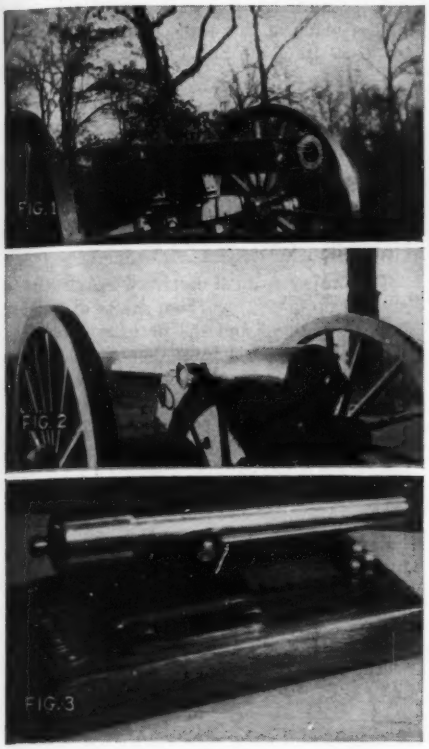


Fig. 1 and Fig. 2. Actual Civil War guns. Fig. 3. The model based on the Civil War guns

Final Check:

1. Do trunnion pins line up — horizontal and vertical?
2. Is fuse hole drilled so that it meets base of bore?
3. Is cascabel symmetrical?
4. Is the rifle barrel and base highly polished?

Manners are what vex or soothe, corrupt or purify, exalt or debase, barbarize or refine us, by a constant, steady, uniform, insensible operation, like that of the air we breathe in. — *Edmund Burke.*

NECKTIE RACK

HOMER C. ROSE
Falls Church, Va.

Discarded motor valves can be made into very practical and modern racks of various kinds as illustrated by the necktie rack shown in Figure 1. Valves can be incorporated in the design of other racks to hold shoes, coat hangers, hand tools, guns, fishing rods, and garden equipment.

Suggested Procedure

1. Obtain the valves and arrange them on a piece of paper in a suitable position to hold whatever is to be hung up.

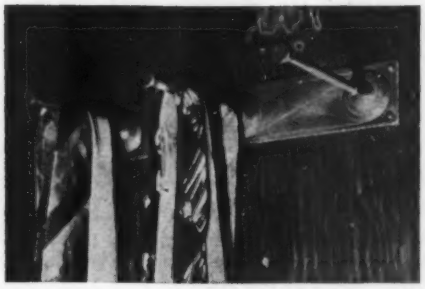


Fig. 1. Necktie rack from discarded motor valves

2. Trace around the head of the valves and sketch the outline of the backplate to coincide with the locations of the valves.
3. Figure 2 shows a number of suggested designs.
4. Transfer the pattern to a suitable piece of sheet metal. Sixteen-gauge black iron or cold rolled steel is suggested.
5. Cut the metal to shape and smooth all edges.
6. Chased designs or peened edges may be desired as shown in Figures 3 and 4.
7. Drill a ½-in. hole through the metal at the center of each valve location.
8. Clamp the valves in place.
9. Weld or braze the valves to the metal through the ½-in. hole from the back.

Alternatives

It is difficult to anneal valves; however, if facilities are available for this, the valves may be annealed and holes drilled through the head so that they may be fastened to a wooden backplate with screws.

A crystallizing or wrinkle enamel may be used as a finish. Small backplates may be fastened by welding to individual valves. These may in turn be fastened to a tool panel or other surface with screws.

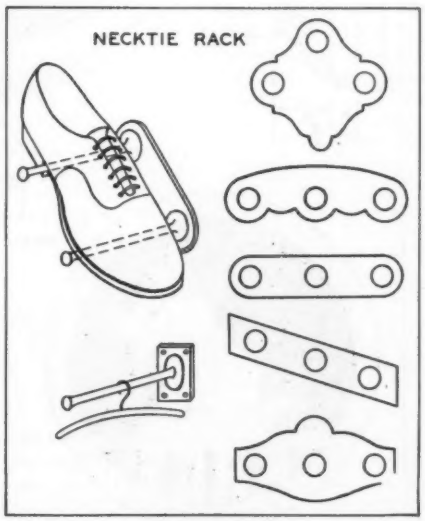


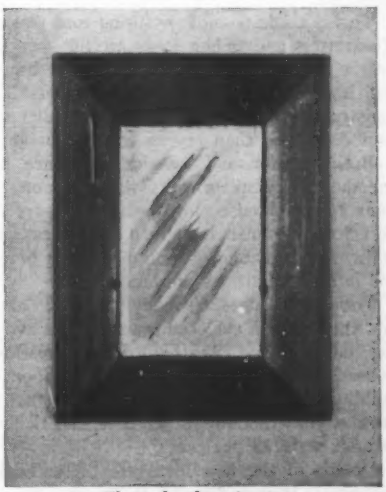
Fig. 2. Discarded valve stems used for making necktie, shoe, and coat racks

Fig. 3. Peening the edges of the backplate. Fig. 4. Chasing the design

THE PLANK OR COURTING MIRROR

VINCENT P. CONNERS
Supervisor of Handicrafts
Special Class Department
Boston, Mass.

This mirror, in Colonial days, along with its everyday functions was called a courting mirror and would be placed flat on the middle of the table with the young man seated at one end and the young lady seated at the other end so that during the evening's visit, each one might have the pleasure of seeing the other's reflection.



The plank mirror

BILL OF MATERIALS

No. of pcs.	*Material*	*Size*
2	Pine, finished	5/8 x 2 x 8
2	Pine, finished	5/8 x 2 x 6¼
1	Mirror glass	3/32 x 3¼ x 5
3	F.h. nails	½ in.

Tools: Complete set of woodworking tools

Procedure:

1. Square up stock to finished dimensions according to standard woodworking rules.
2. Cut recess (called sinkage) ⅛ in. deep from a rectangle that is formed by lines drawn 1½ in. from all four edges.
3. Bevel the four edges of the wood from the sinkage down to ¼ in. of the thickness. Be sure to do the two sides (going with the grain) first.
4. Make a hole ⅛ in. in diameter in top for hanging.
5. Set in glass.
6. Drive in a nail (½ f.h. nail) on all four sides so that the head holds the glass in the sinkage.
7. Sand, stain, and shellac.

This is an authentic Colonial piece and we find it being reproduced today by many Pine Product Companies.

LOWER COST HOMES

By using improved construction methods, the Small Homes Council at the University of Illinois has learned how to cut one tenth of the cost of building a house. These methods can be used by any builder on houses designed with non-load-bearing partitions. The saving is in both labor and materials.

The ideas were developed and tested in a year-long research project during which six houses were built. The houses, identical in size and arrangement, used the industry-engineered house plan developed by the Producers' Council and the National Retail Lumber Dealers Association. This plan has dimensions co-ordinated on a basic modular unit of 4 in., so that wastage of materials is kept at a minimum.

The most important construction idea presented by the University is building the house as one room and then installing interior partitions which do not carry any of the load of the structure.

This is made possible by using roof trusses. The rafters and ceiling joists are put together on the ground in the form of triangular frames which are then lifted into place as units. The construction is strong even though smaller size lumber is used than in conventional building.

Both interior and exterior walls are put together as complete units while flat on the floor and then raised into position. Floors are laid, interior finish is applied on ceilings and walls, and plumbing is put into place before the interior partitions are erected.

These methods save many hours of labor, and the house is enclosed quickly, thus avoiding delays from weather. In its research houses, the University found that labor of building the roof was cut 26 per cent; that of interior construction, 38 per cent, and that on exterior wall, 18 per cent.

Details of the new ideas are presented by the Small Homes Council in a nontechnical, illustrated, 12-page circular titled "Construction Methods." Single copies are free for a limited time.

The research project was a co-operative one between the University of Illinois and the U. S. Department of Commerce Office of Technical Services. The Producers' Council, a group of manufacturers of building materials, acted as technical advisers.

The practices developed do not require special tools nor depend on mass production or mass buying. They are improvements and refinements in the assembly of a house, and can be applied to almost any combination of materials. Three of the houses built during the study were frame; three brick.

Through complete, accurate, and carefully engineered working drawings, the building materials were precut, eliminating much of the delay, expense, and inefficiency of conventional construction methods. Roof trusses, wall panels, gable ends, stairs, and other units were assembled on the site before incorporation into the house, because it is easier to work on the ground or floor than from scaffold or ladders.

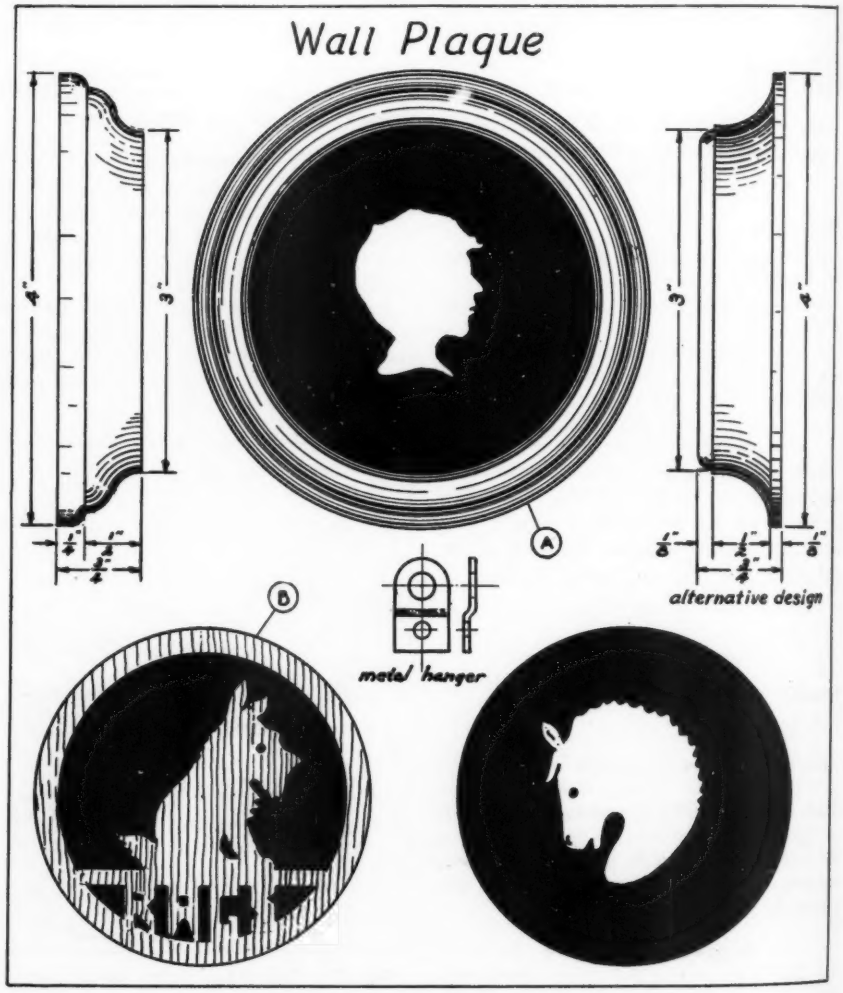
A technical report with tables of man-hour studies made in this project also is available for $2.50 from the Small Homes Council.

WALL PLAQUE — A PROJECT MANUAL

EMERSON WM. MANZER
Platteville State College
Platteville, Wis.

The project manual described in this article is made up of 8½ by 11-in. sheets of mimeographed material and the necessary drawings in blueprint or offset form. The manual shows what materials, supplies, and equipment are necessary to make the project, and gives directions for making each part of the project. The various operations are broken down and key points are given which offer aid to the student on various operations, shop kinks, or safety measures.

References covering specific operations are given and in some instances addresses for sources for specific supplies are given. The



Wall plaques by Emerson Wm. Manzer

instructor making up manuals for projects will know just what kind and quantity of materials and supplies are required for a semester of work.

Project manuals motivate classwork and enable the student to progress on his own initiative without too much personal direction. Shop demonstrations for the entire class will show how various operations are performed, and these general demonstrations will function in many of the projects. Through the project the student will be able to apply what he has learned from the demonstration and specific directions.

The references and key points offer opportunity for good testing material. A good test should be an integral part of the project manual, but it should not be included in the manual itself. Tests should be made up on special sheets and given to the student upon completion of the project.

Project: Wall Plaque
Section: Materials — Supplies — Equipment

Materials Required:

1. Wood	1 scrap piece of pine, maple, or birch, ¾ by 4¼ by 4¼ in. 1 piece of ⅛-in. plywood, pine, or basswood, large enough to make the overlay desired for the plaque
2. Metal	Small piece of metal to make hanger

Supplies Required:

1. Sandpaper	½ sheet No. 0; ½ sheet No. 3–0
2. Screws	1 small roundhead screw for hanger
3. Lacquer	Clear
4. Lacquer	BLACK and colored if desired
5. Brushes	1-in. dime store brush or good lacquer brush; 1 artist's brush, pointed
6. Undercoat	Flat white for lacquer top coat
7. Filler	Paste wood or Lakerfill
8. Thinner	Lacquer thinner

Equipment Required:

1. Tools	6-in. dividers, rule, screw drivers, set of turning tools, 3/32 and 3/16-in. drills, center punch, jig-saw blades (fine)
2. Machines	Wood lathe, jig saw, band saw, drill press

Project: Wall Plaque
Section: Making the Back — Part *A*

Directions	*Key Points*
Cut wood for back ¾ by 4¼ by 4¼ in. Scribe a circle using a radius of 2 and ⅛ in.	Select solid piece of stock. Find center of back by drawing diagonal lines from opposite corners.
Band-saw to the circle scribed on the block. Do not cut inside of the line.	Set band-saw guard about ½ in. above the wood block. Start the saw into the cross grain of the wood.
Fasten back to a proper size face plate using screws of a proper length and size. Keep screws near the center of the block so they will not come in contact with the turning tools.	Center the block of the faceplate. If hardwood is used for the block, drill anchor holes for screws. Put a dab of soap or wax on the end of each screw. Use screw driver with tip which fits screw slot.
Turn the block to 4-in. diameter. Cut contour of block as shown in the working drawing, or create your own pattern. Sandpaper contour and face of block.	Do not use sandpaper until all cutting has been done. When turning is done do not remove work from faceplate.
Fill the open pores of the wood if a smooth job is wanted, especially the end grain of the wood block. Sand smooth.	Paste wood filler will do a good job of filling and will sand smooth. Lakerfill is also excellent for filling.

References:
Information and Operation Units in Machine Woodworking, Smith, McCormick Mathers Publishing Co., pp. 29–35, 104–105; pp. 63–69–7–11.
Instruction and Information Units for Hand Woodworking, Douglas-Roberts, McCormick-Mathers Publishing Co., pp. 51–54; 99–104; 111–113.
Supplies: Lackerfill, Lackerfill, Inc., 1204 Cleveland St., Lansing 6, Mich.

Section: Overlay Cutout — Part *B*

Directions	*Key Points*
Draw original pattern or design, or trace suitable one from other source. Silhouette photographs of persons or pets may be traced or regular snapshot pictures may be cut out for the overlay.	Select a design or pattern that has some personal characteristic. A profile of some member of the family always makes a good plaque. Check your snapshots.
Trace selected design on a piece of ⅛-in. plywood or glue snapshot to ⅛-in. plywood. Cut out on jig saw using a very fine saw blade. Several pieces may be done at once.	Accurate sawing is required for a good clean job. Use care if gluing is done so that the face of the work is free of spots.
Sand back of overlay with fine sandpaper.	Coat back of overlay with clear lacquer. Let dry.
Coat face of overlay with clear lacquer. Let dry. Sand lightly and give second coat.	The second coat will make the job look better.

References:
Instruction and Information Units for Hand Woodworking, Douglass-Roberts, McCormick-Mathers Publishing Co., pp. 107–108; 91–92.

Section: Finishing and Assembly

Directions	*Key Points*
Give part *A* a coat of clear lacquer or an *undercoat* for the color desired.	When dry, sand lightly with very fine sandpaper. Cover all of the work with lacquer.
Give second coat of clear lacquer, or colored *lacquer* desired. Dry thoroughly.	Use lacquer thinned with 1/3 thinner. Paint with good lacquer brush.
Place work on lathe and lacquer face of plaque with *black* lacquer. Turn work on lathe by hand while applying the lacquer to the face.	Let dry thoroughly before further work is done.
Coat back of overlay with clear lacquer, thinned. While lacquer is wet place overlay in place on the *dry face of the plaque.* The lacquer will act as an adhesive and thus hold the overlay on the plaque.	Be sure the overlay is centered properly. Press down lightly with fingers and hold till lacquer sets sufficiently to hold overlay in place.
Attach metal holder on back. Place it low enough so that it will not be seen when plaque is hung on wall.	Mark spot for the hanger screw and if necessary drill a small hole for the screw.

MINIATURE OIL LAMPS ELECTRIFIED

E. A. RERUCHA
River Grove, Ill.

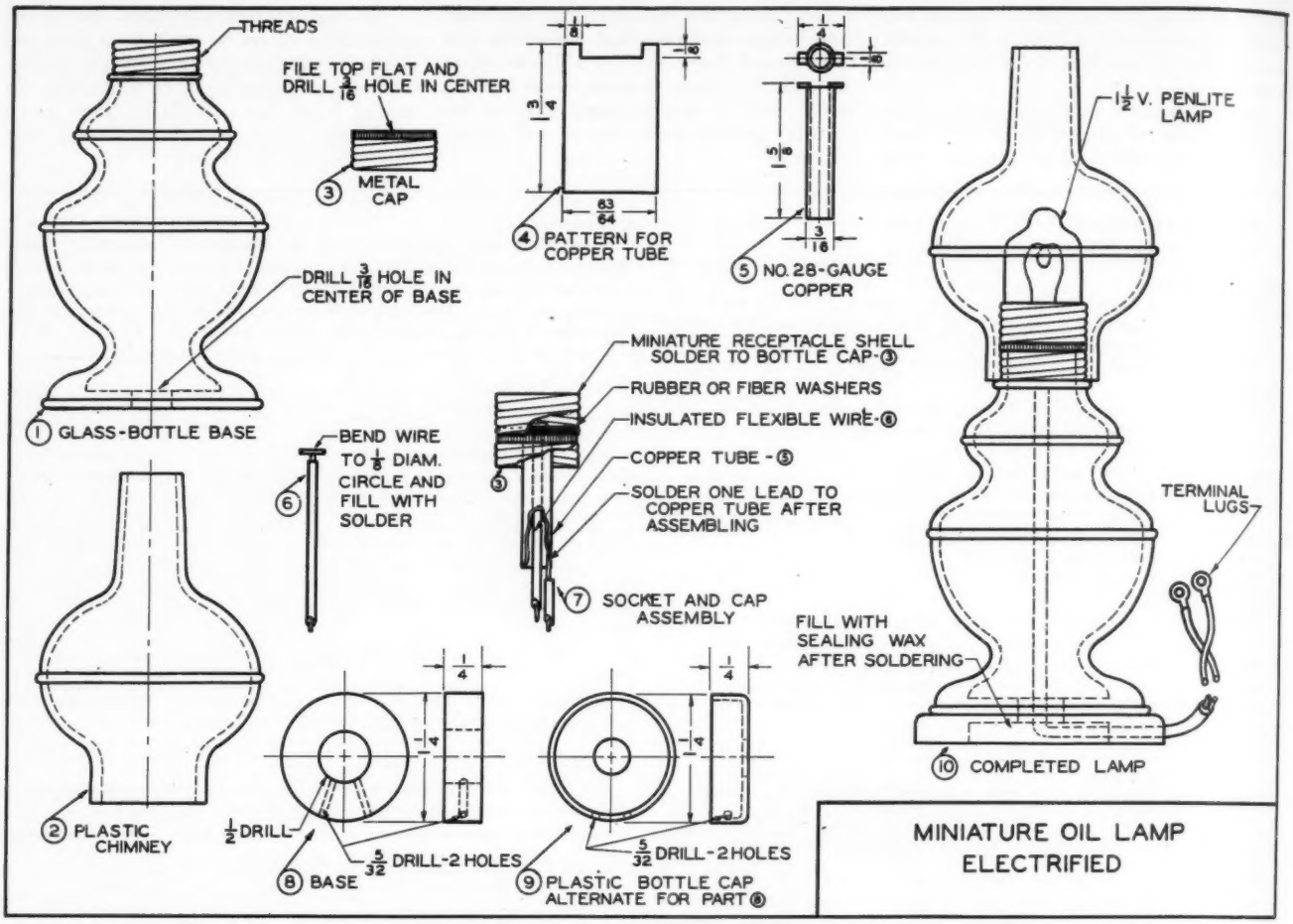
Perfume bottles which are an imitation of old-fashioned oil lamps may be obtained in dime stores and converted into a miniature electric lamp as shown in the sheet of details.

The bottle consists of a glass base, plastic chimney (in a variety of colors), and a metal cap as shown in Figures 1, 2, and 3. The converted and completely assembled lamp is shown in Figure 10.

To make the lamp proceed as follows: Drill a 3/16-in. hole in the base of the bottle as shown in Figure 1. First scratch the surface at the center spot of the bottom with the end of a three-cornered file so as to center the drill. Grind the drill so that it is not too pointed. The end of a small three-cornered file ground to a slight bevel may also be used as a drill. Wrap several layers of a strip of rubber cut from an old tire tube around the base and clamp in a vise, being careful not to crush it. Apply turpentine to the drill point while drilling. When the point of the drill penetrates the base, care should be taken so as not to crack the glass. A hand drill should be used for drilling. When the hole is large enough to admit the end of a small round file the rest of the glass may be removed by careful filing.

Drill or punch a 3/16-in. hole in the center of the metal cap as shown in Figure 3. The oval top surface of the cap should be filed flat before making the hole.

Remove the screw shell from a miniature


THREADS
FILE TOP FLAT AND DRILL 3/16 HOLE IN CENTER
3 METAL CAP
4 PATTERN FOR COPPER TUBE
5 NO. 28-GAUGE COPPER
1½ V. PENLITE LAMP
DRILL 3/16 HOLE IN CENTER OF BASE
1 GLASS-BOTTLE BASE
MINIATURE RECEPTACLE SHELL SOLDER TO BOTTLE CAP-3
RUBBER OR FIBER WASHERS
INSULATED FLEXIBLE WIRE-6
COPPER TUBE - 5
SOLDER ONE LEAD TO COPPER TUBE AFTER ASSEMBLING
BEND WIRE TO 1/8 DIAM. CIRCLE AND FILL WITH SOLDER
6
7 SOCKET AND CAP ASSEMBLY
TERMINAL LUGS
FILL WITH SEALING WAX AFTER SOLDERING
10 COMPLETED LAMP
2 PLASTIC CHIMNEY
1/2 DRILL
5/32 DRILL-2 HOLES
8 BASE
5/32 DRILL-2 HOLES
9 PLASTIC BOTTLE CAP ALTERNATE FOR PART 8
MINIATURE OIL LAMP ELECTRIFIED

Electrified miniature oil lamp

lamp receptacle or socket. See Figure 7. Cut out a piece of 28-ga. copper to the shape shown in Figure 4. Form over a nail to the shape shown in Figure 5. Bend the lugs outward at right angles. Assemble the copper tube, lamp screw shell, and bottle cap as shown in Figure 7, and solder together. The copper tube is inserted into the hole in the bottle cap so that the lugs are between the cap and lamp shell. File off any solder projecting over the diameter of the cap and shell so that the bottom of the chimney can slip over it.

Push a piece of plastic insulated radio hookup wire through the copper tube from the bottom. Remove about ¼ in. of the insulation at the top end. Place two small fiber or rubber washers over the wire which have been filed to fit tightly inside the lamp shell. Bend the bare end of the wire to the form of a small circle and fill with solder as shown in Figure 7. This wire must be insulated from the lamp shell. File the drop of solder flat. This will serve as the middle contact for the lamp. Now pull the wire and washers down so that they are at the bottom of the screw shell.

Insert the copper tube and wire into the neck of the bottle and through the hole in the bottom and screw on the cap.

Make a wood or plastic base as shown in Figure 8, and cement to the bottom of the bottle with airplane or any suitable cement. As an alternate part a plastic bottle cap may be used for the base, and prepared as shown in Figure 9.

When the cement has set the lead wires may be connected. Any small diameter, flexible insulated wire may be used. Wires such as used in cables are ideal but small lamp cord will do. Insert the wires through the 5/32-in. holes in the sides of the base as shown in Figure 8 or 9. Solder one lead to the copper tube as shown in Figure 7, and the other to the wire in the tube. Make sure that the wires do not short. Fill the hole in the base with sealing wax level with the bottom of the base. Solder two lugs to the other ends of the wires.

A 1½-volt dry cell will operate the lamp which is the type as used in the "Penlite" type of flashlight. To turn on the lamp the chimney is removed and the lamp screwed in to make contact. To put out light remove chimney and unscrew lamp partway to break the contact.

With the several designs available in different colors, very attractive working models of miniature lamps may be made. The lamp may be used as a night light to light the clock, etc. Two dry cells may be connected in parallel and will last longer. The battery may be placed in the dresser drawer and the wires brought out at the back.

If the glass bottle is of clear glass it may be colored to conceal the tube and the wires inside. This may be done by painting the inside. Pour in a little enamel of the desired color and revolve and tip the bottle until the entire inside surface is covered. Drain out the surplus paint. This, of course, must be done before assembling and attaching the wire leads.

Larger bottles of the same type about 6 or 7 in. high are also available. The method of converting is similar except that the size of the base and length of tube must be adapted to the particular bottle used.

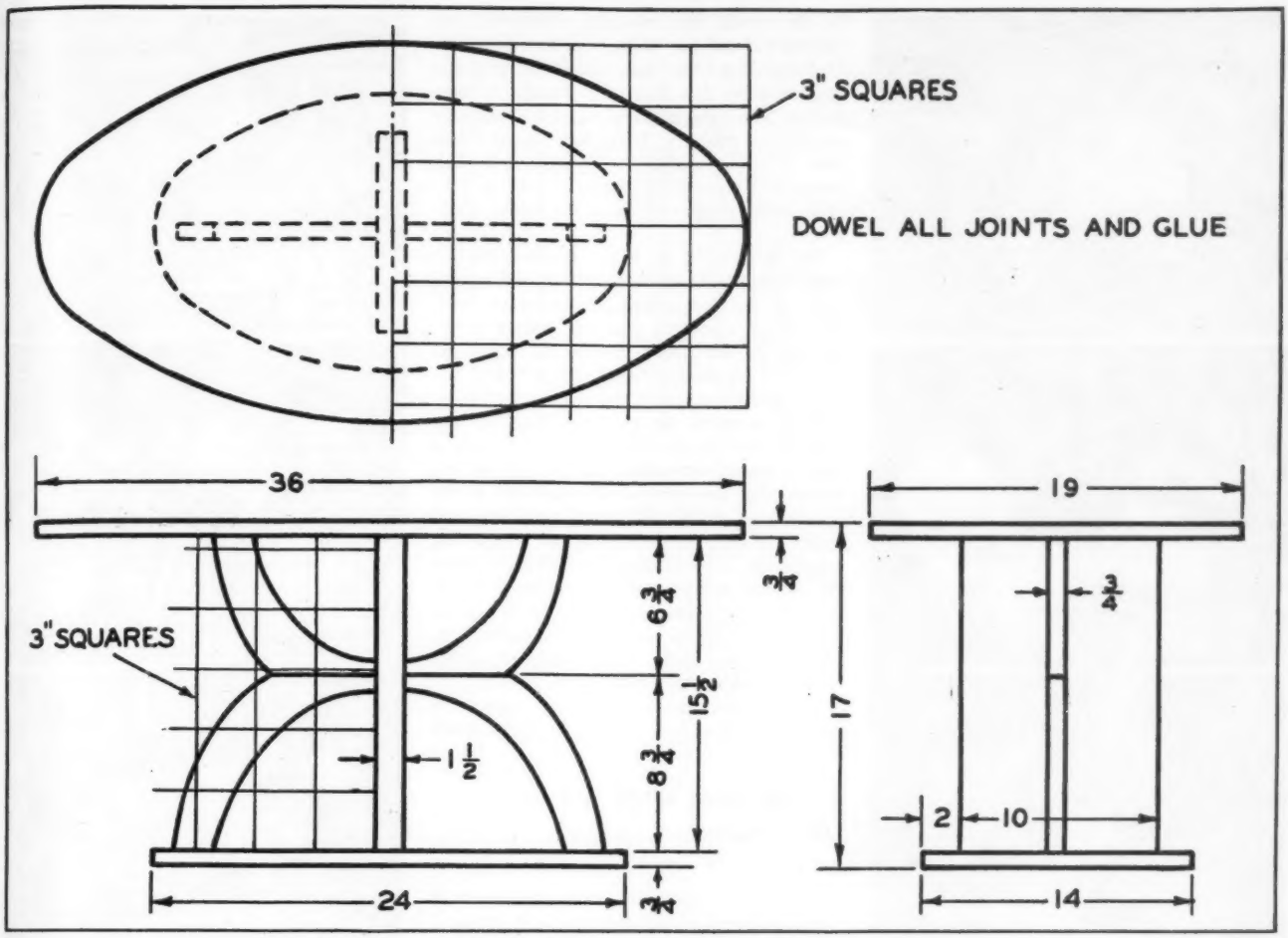
MODERNISTIC COFFEE TABLE

WALLACE HAGLUND

International Falls, Minn.

The design of the coffee table, described in this article, is a combination of straight on curved lines. The lines of the base blend well with the simple lines of the top.

The project can be adapted to the small as well as the large school shop. It is an ideal



Details of modernistic coffee table

small school shop project, because it does not require any special tools and equipment other than those used in a small shop.

This project can be made by the average high school student. Its simple construction and design will be appreciated not only by the student but also by the student's parents.

This table will confront the student with a problem that will test his ability to plan a procedure, lay out a project to conserve on lumber, measure with exactness, and make dowel points.

The type of wood used should correspond with the type of wood used in the student's home furnishing.

BILL OF MATERIAL

No. of pcs.	*Name*	*Size*
1	Top	¾ x 19 x 36 in.
1	Base	¾ x 14 x 24 in.
1	Upright piece	1½ x 10 x 17 in.
2	Brace (bottom)	¾ x 8 x 6¾ in.
2	Brace (top)	¾ x 10 x 8¾ in.

Procedure

1. Draw all necessary stock from the stock room.
2. Plane all boards and glue to form top.
3. Cut top as shown.
4. Repeat steps 1, 2, and 3 to form the base.
5. Square the upright piece and cut to proper length.
6. Square off the board on which braces are to be cut.
7. Cut the braces.
8. Measure and drill the holes which are to form the dowel joints.
9. Sand all surfaces to desired smoothness.
10. Glue all dowel joints and clamp to hold in proper position.
11. Remove excess glue.
12. Select the finish you wish to use and apply it.

MINIATURE HOUSE KIT

R. PAUL LIGHTLE
Industrial-Arts Instructor
James H. Smart School
Fort Wayne, Ind.

In September our industrial-arts supervisor, George H. Russell, called a special meeting of the Fort Wayne industrial-arts instructors. One of the purposes of this meeting was to acquaint us with a new and different project, this project being a complete kit of materials for a model house of traditional construction, not prefabricated. The kit contains accurately scaled miniature building materials necessary for building an authentic five-room Cape Cod bungalow. There is also included a complete set of three-dimensional working drawings. In this way, the pupil with a minimum of drafting background has a visual aid for each step in the construction process. Complete printed instructions are also given on each drawing for that particular phase of construction.

More than one hundred house-building kits were donated to the Fort Wayne senior and junior high schools by the Lumber and Supply Dealers Club. We were given the opportunity for organizing the project as we saw fit. At James H. Smart Junior High School we chose to handle it as a club project. Boys were selected from 7B, 7A, and 8B classes. 8A classes were not given kits because the project extends over the whole school year and they will be leaving at the end of the first semester to enter high school.

It is not intended that we make carpenters out of our Junior High pupils. Instead, it provides a hobby, challenging skills that are not reached by model airplanes or other model construction. All trade learning is incidental, but not accidental. The boy can see his house grow, step by step, from basement to finished product. In this way he sees construction,

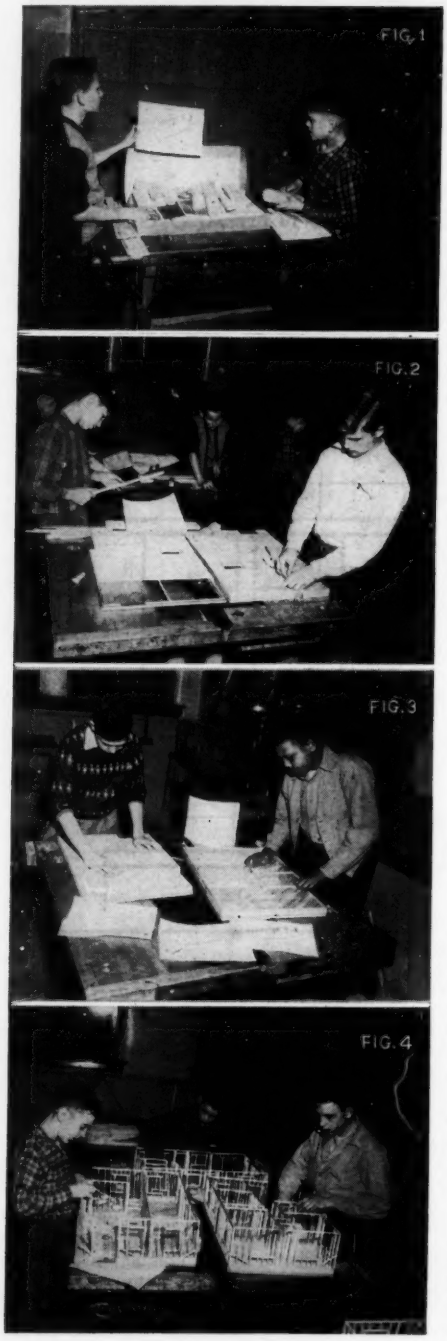


Fig. 1. Studying the plans and materials. Fig. 2. Laying the floor joints. Fig. 3. Laying the floors. Fig. 4. Wall construction

reads about it, gains advice from his instructor, and no doubt, much from his parents.

The activity was limited to 15 boys as there were only that many kits available for our school. The boys decided that since by necessity it is a select group, the project should be protected by getting in the club only those with the best qualifications and interests. Working with this idea uppermost in our minds, the following agreement was worked out and signed by each club member: "I accept this home construction kit with the understanding that I carry it through to completion. When the job is completed, it becomes my private property. If for any reason I find that I cannot complete the project, I shall return it to James H. Smart School so that some other pupil can finish it. Signed, John Doe."

My observation is that this agreement has fixed upon each and every pupil the importance of the undertaking, the desire to finish that which is started, and the honesty of returning the kit under certain conditions. At this time, three kits have been returned because boys have moved out of the city.

As an incentive for good workmanship, the Lumber and Supply Dealers Club set aside a sum of money for prizes. At the close of the school year the completed homes are to be placed upon exhibit. They will be judged and prizes awarded. There will be two groups for competition, junior high and senior high. What the outcome will be cannot be predicted at this time. The boys are progressing with a great deal of enthusiasm and zeal. Naturally, mistakes are being made. As a whole, the project is very much worth while.

The pictures accompanying this story were taken to show various stages of progress made by the club.

A MAN WITH AN IDEA

MELBA KLAUS

Carlinville, Ill.

One of the most outstanding examples of what vocational agriculture, taught in the local high school, can accomplish for the entire community is that shown at the Casey, Ill., Township High School. Much of the credit goes to the agricultural instructor, Walter A. Newlin, who came to the community 26 years ago. Since then the school district has more than doubled in size, largely due to the service given to farmers by the agricultural department in the high school. Too, today there is a new mutual feeling between the town and country people around Casey.

Mr. Newlin proved to his neighbors how a submarginal farm could be made to pay by modern soil building practices, for right after he came to Casey he bought just such a farm to practice what he was teaching. A member of the Casey Rotary Club for 21 years, Mr. Newlin persuaded the club, along with a group of farmers, to sponsor the opening of a limestone quarry in 1927 near Casey. Although another quarry was opened in 1938 near the town it still is hard to supply enough limestone, so potash and phosphorous have supplemented the limestone. Red clover is now growing on fields in the vicinity since the land has been under the soil fertility program.

Previous to the opening of the Casey quarries, the Farm Bureau and the Casey Vocational Agriculture Department co-operated in 1922 and 1923, to have 450 tons of limestone shipped in from Greencastle, Ind.

Fig. 5. Various stages of progress. Fig. 6. Laying the shingles. Fig. 7. Roof construction. Fig. 8. An interchange of opinions

They received this free except for freight charges. At that time 40 boys were taking agriculture in the school. Immediately soil tests were made and test plots laid out to prove the difference of treated and untreated plots where the proof could plainly be seen by all the farmers. The once productive land around Casey became unproductive around the beginning of the 1900's. Today that has all

been changed and once again it is an active high-producing farm community. In recent years the grain elevator has taken in as much as 10,000 bushels of beans per day during a part of the busy season. Previously corn had to be hauled into the community but now half of the corn raised is trucked out. All these changes are due to the successful operation of the soil fertility program.

The improvement in agriculture in the community is a result of the co-operation of the Clark County Farm Bureau, the College of Agriculture, and the University of Illinois originally. Later the vocational agriculture department took part in things, one of which was pasture improvement. They also assisted farmers with the inoculation of legumes back in 1935 when it was new to many farmers. In the same year they co-operated with the College of Agriculture in holding meetings or schools for farmers, an average of 140 farmers attending each session.

The school has a farm shop where the agriculture students build such projects as hog feeders, repair farm machinery, learn to handle tools, and where farm management is taught in combination with shopwork. The agriculture students started cleaning seed free of charge for their fathers, charging others slightly at a time when such a service was unobtainable elsewhere. The students also learn how to care for and feed calves, sheep, and hogs, and how to show their animals properly in livestock shows.

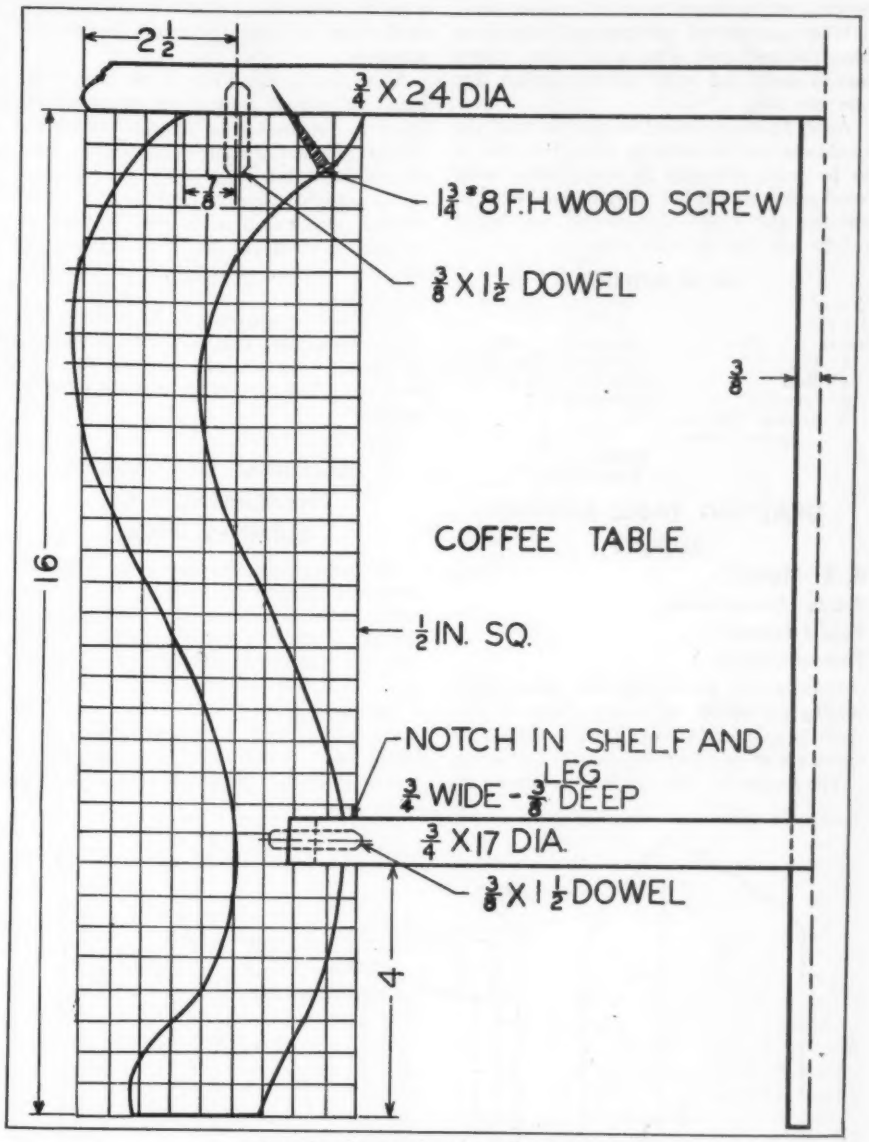
The great success of the vocational agriculture department of the Casey high school is the result of good planning, the co-operation of farmers with the school, and the idea of one vocational agriculture teacher — Walter Newlin — who knew how to sell the value of the school to the community, by the service that the agriculture department of the Casey school gave to its students.

PERIOD STYLE COFFEE TABLE

ALVIN R. LAPPIN
Salinas Union High School
Salinas, Calif.

The coffee table as illustrated and described in this article is simple in design, yet involves the use of many basic woodworking tools and machines. Common, yet sturdy, joinery has proved to be very popular with the beginner. Almost any cabinet wood is suitable for this small table, mahogany or walnut being recommended.

Period style coffee table



Details of period style coffee table

Construction

From the working drawing lay out a full-size leg pattern. Cut the pattern accurately to size and use it to trace upon the wood selected for the legs. Conservation of material is best accomplished by tracing two legs upon one piece of material, *nesting* one within the other. The legs are then sawed and worked to size by employing spokeshaves, spindle sander, or shaper.

The next operation is to locate and notch the legs for the ⅜-in. shelf, as shown.

Material for top and shelf may next be selected and glued up. After sufficient smoothing, cut out both top and shelf to the diameters given. At this point a shaped edge on the top adds much to the professional appearance of the finished project.

Four equal distant points should next be laid out on the shelf where it is to be notched ⅜ in. for receiving the legs. A simple and accurate method for the beginner to use in locating the shelf notches is to place the notched legs in position on the shelf and scribe around them, thus marking that portion of the shelf which is to be removed.

All hole positions are then laid out and holes are bored for both the notch-doweled joints securing the legs and shelf; and also for the doweled leg-top joints which give added strength. Holes for the wood screws which fasten the legs to the top may also be located, drilled, and countersunk at this time. Dowels are then cut to length.

After all parts are well sanded, assemble the table *dry*. Leg blocks cut to fit each outside curved portion of the legs at the shelf

position will facilitate the clamping operations.

When accuracy of jointing and fitting have been checked apply glue to all joints, clamp legs to shelf, and secure screws through legs into the top.

Apply finish as desired keeping in mind the conditions and situation in which the table is to be used. Intensity of color when using wood stains should be carefully considered in finishing this school-shop project, so that it will fit into the student's home.

BILL OF MATERIAL

No. of pcs. required	*Part*	*Material*	*Size*
1	Top	Mahogany	¾ x 24 x 24
1	Shelf	Mahogany	¾ x 17 x 17
2	Legs (4)	Mahogany	
8	Leg-top joints and leg-shelf joints	Maple or birch dowels	

DRAFTING TABLE RAISING BLOCKS

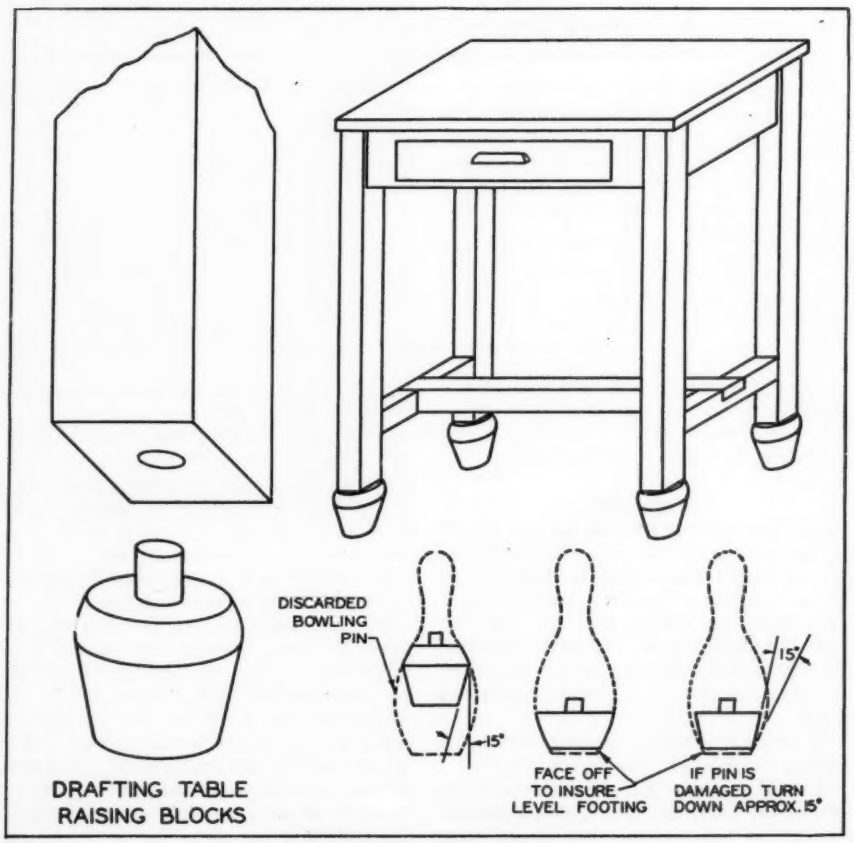
R. E. MURRAY
Trades Co-ordinator
Public Schools
Fremont, Ohio

This project affords splendid manipulative turning procedure. It is very cheap because there is an abundance of used bowling pins, which are often obtainable just for the asking.

The amount of time required in turning out a set of these raising blocks is comparatively small, thus retaining the pupil's interest and attention.

As to usefulness, there is no limit, since pupils of various stature are frequently enrolled in the mechanical drawing classes and require different drafting-table heights. Thus, the measurements given in the accompanying sketch may be altered to coincide with the individual physical abnormalities. If need be, the rear set of blocks can be made taller than the front so as to afford a more inclined table top surface.

After turning and sanding the blocks, a filler should be applied. This is then to be followed by a coat of varnish stain to match the table, or a clear coat of varnish or shellac may be applied.



Drafting table raising blocks

ALCHEMIST DISCOVERED PHENOMENON OF LUMINESCENCE

The phenomenon of luminescence is believed to have been discovered by an Italian bootmaker, Vincencio Casciarola, who lived in Bologna in the late sixteenth century. Casciarola, like others of his time, practiced alchemy, trying to convert heavy minerals into gold.

One day, about 1600, so the story goes, while on a stroll Casciarola picked up a heavy stone, now believed to be the mineral known as *barytes*, which he took back to his shop for his experiments. After attempting unsuccessfully to change it into gold by heating it, he tossed it aside. Lo and behold, when he blew out his candle that night, the fired rock glowed eerily in the dark.

The stone had been given luminescent properties, along the lines now used to produce commercial luminescent materials synthetically. It absorbed light during daytime hours, and, when the startled bootmaker saw it, the stone was re-emitting some of this energy as an eerie glow.

It is only during comparatively recent times that this phenomenon has been exploited. Now luminescent paints, plastics, and other materials that glow are available as decorative treatments to brighten darkened interiors and as safety markers to make darkness less hazardous to move around in. — *The New Jersey Zinc Co.*

ORNAMENTAL WOOD HOOKS

HAZEL F. SHOWALTER
Davenport, Neb.

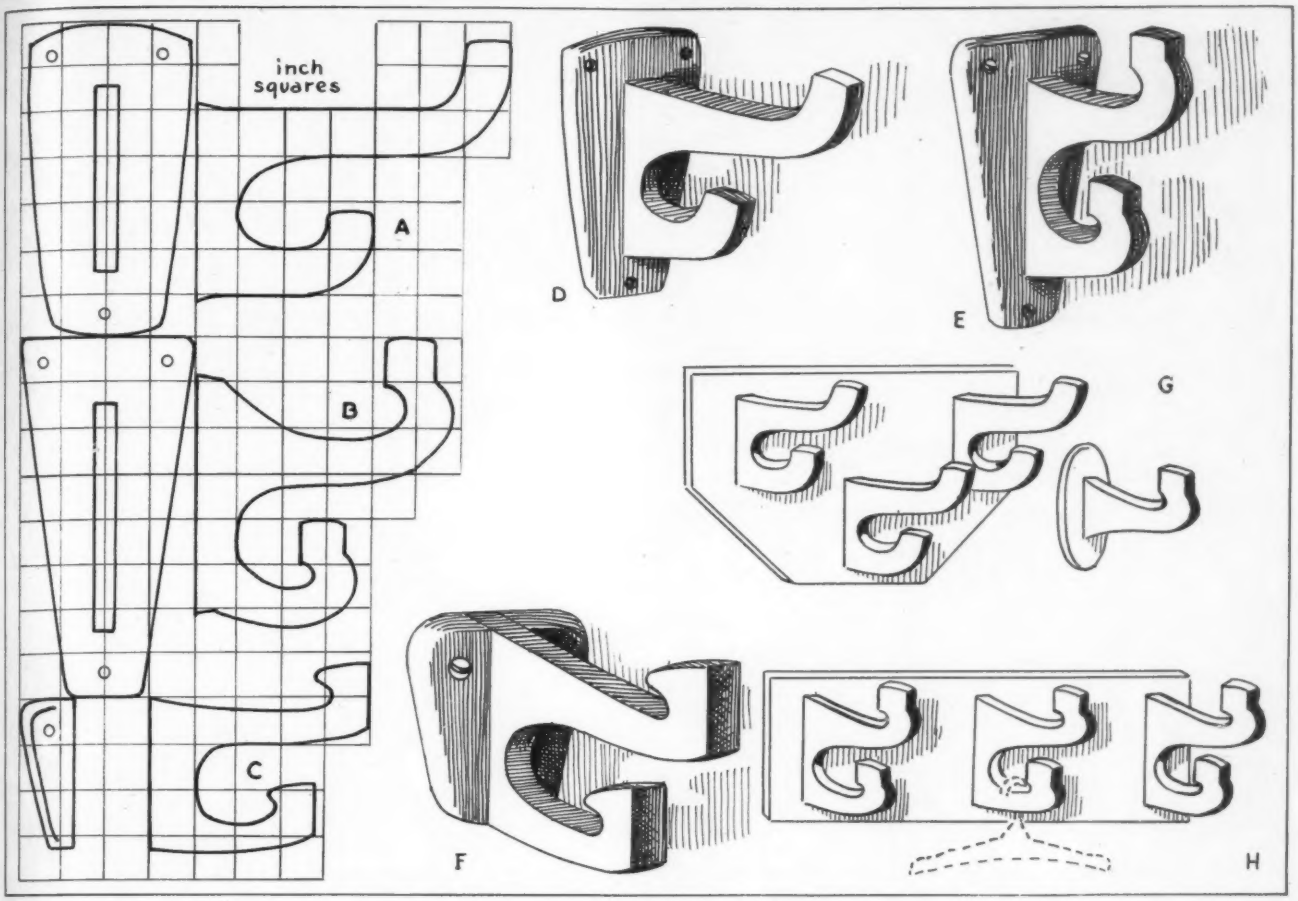
Many uses may be found about the home for such hooks as are described in this article. In the hall or in the closet, they will take care of the wraps of the family and of guests. Any number of hooks may be placed on a single back as suggested by the sketches G and H. Coat hangers on many of the hooks add to their practicability. In the shop, garage, pantry, and basement, there may be use for one or two of the hooks. A strip with small hooks might be placed low on the wall to supply a place for the children to hang their clothes.

The size of the hooks may vary as desired. If the three patterns given are drawn in inch squares, A and B will make unusually large hooks for holding the largest and heaviest wraps while C will make a small hook for light wraps or for children's clothes.

Mortised to a back suited in size, shape, and thickness to the hook as shown at D and E, or with a back made of two wings as at F, the hooks are ornamental as well as useful whether one prefers the severely modern shape of D, the rather elaborate curves of E, or the delicately graceful lines of F.

Thick plywood or hardwood is needed for the hooks with as thick or nearly as thick wood for the back if used for only one hook. The original models of these hooks were made of ¾-in. material, the hook F of walnut, the two other hooks of plywood with backs of pine. It is entirely practical to glue two thicknesses of wood together with the grain running opposite ways when ready-made plywood is not at hand. Half-inch material could be used especially for smaller sized hooks.

The mortise should be cut to fit the exact size and shape of the hook it is to hold and the hook glued into it. The shape of the back edge of the hook keeps it from pulling out. A wing back as is shown on F might be made on any of the hooks. Each wing is fastened to the side of the hook by two flat head screws, the heads of which are set into the wood and smoothed over with plastic wood or similar



Ornamental wood hooks by Hazel Showalter

substance. Roundhead screws are used to fasten the backs of the hooks to the wall or wherever they are to be placed.

The finish will depend upon the material used and the place in which the hook is to be used. A transparent finish is desirable on beautiful woods; white enamel is suggested for a hook for a dressing gown in the bathroom; colored enamels might be chosen for many places.

"WHAT'S WRONG WITH MY DRAWING?"

EARL KIMBALL

West High School,

Waterloo, Ia.

"How come that's dimensioned wrong?" The student draftsman was quite perturbed at the yellow marks on the check print of his detail drawing.

"You can't do that," said the checker. "That won't go. Drawings of machine parts must be made to provide accurate manufacturing directions. Views with dimensions and explanatory notes must be drawn so that a part cannot be made incorrectly through following instructions on the drawing."

The subject of dimensioning is of such importance that it merits consideration second only to the choice and placement of views. The usual high school textbook on mechanical drawing deals at length with visualization and placement of views. The pupil solves a problem by drawing a plate. Because his solution is not primarily for the purpose of providing accurate directions for making the part, dimensions assume minor importance to him. He does not consider that the choice and placement of dimensions is an essential part of his problem.

The following fundamental concepts should be perfectly clear to the drafting student:

1. Every machine detail is a functioning part. It has a "job" to do. It must fit where it belongs. While the detail draftsman is not called upon to design the part, he must dimension it so that when it is made, it will fit properly.

2. Every dimension and note on a machine detail is there for the one purpose of giving accurate directions for making the part.

3. Machine work is always done within limits, that is, maximum and minimum dimensions. These limiting dimensions are the largest and smallest sizes permitted by interchangeability and function of the part.

Perfection in machine work is an ideal which is never attained. Nothing is ever made exactly right. The student learns in geometry that a point has no dimensions. When told that if a perfect sphere were placed on a perfectly flat surface the two surfaces would not touch, he begins to see that perfection is only an ideal. A high degree of precision can be attained, but only at high production cost. As a rule, the greater the allowable variation the lower the production cost.

Views must be chosen and placed with discrimination for all views are not of equal importance. Likewise, dimensions must be chosen and placed with discrimination, for all dimensions are not of equal importance. As some views are not needed and should be omitted so also some dimensions are not needed and should not appear.

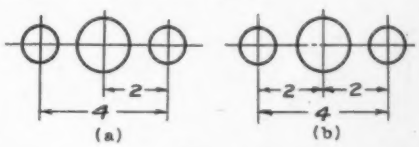


Fig. 1

A correct method of dimensioning is shown at (*a*), Figure 1, while the dimensions shown at (*b*) present an unattainable ideal and are therefore not desirable. Some firms add a note to their drawings, "All finished dimensions plus or minus 1/64 unless otherwise specified." Under this condition (*a*) is correct, and (*b*)

becomes correct with the addition of the limits plus or minus 1/32 to the 4-in. dimension.

In the case of a series of holes in a straight line, as in Figure 2, it will be seen that (*c*) designates limits of plus or minus 1/64 on the dimension between the first and last holes. In (*d*) the tolerances on the dimensions between holes add together while in (*c*) they do not. Dimensioning as at (*d*) should be used only when the addition of tolerances is of no significance.

Assuming, as the first step in providing accurate directions, that the views of a machine part have been correctly chosen, the second, and equally important step, is the selection and placement of dimensions. The following rules have been found useful guides in the choice and placement of dimensions. Figure 3 illustrates the application of the rules:

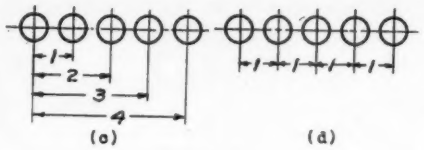


Fig. 2

1. Place each dimension where it will indicate clearly the points on the object to which it refers.
2. Relate center lines to each other.
3. Relate finished surfaces to center lines.
4. Relate finished surfaces to finished surfaces.
5. Relate rough surfaces to center lines, finished surfaces, or to other rough surfaces.

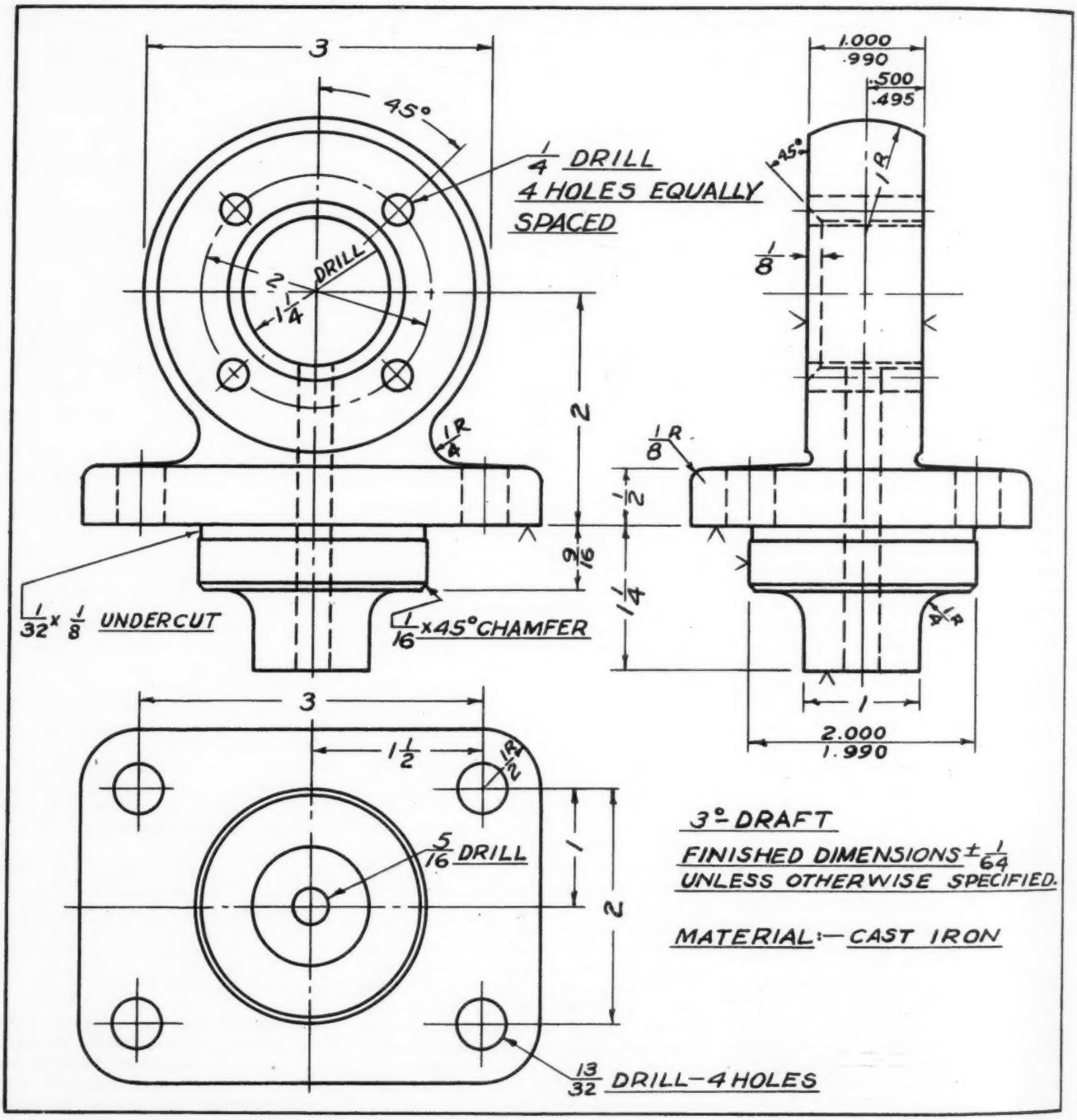


Fig. 3

6. Assume limits of plus or minus 1/64 on all finished dimensions unless otherwise specified.

7. Give diameters of circles and radii of arcs.

8. Avoid duplicate dimensions. When dimensions may be added or subtracted so as to equal another dimension, the dimension of least importance should be withdrawn.

9. Avoid dimensions in series when added limits might interfere with assembly or function of the part.

10. Use explanatory notes to give data which cannot be shown clearly otherwise.

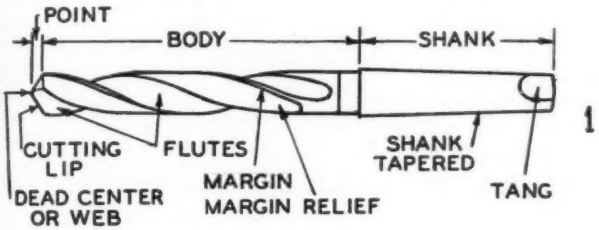
THE TWIST DRILL

HAROLD BAXTER, Student
Oswego State Teachers College
Oswego, N. Y.

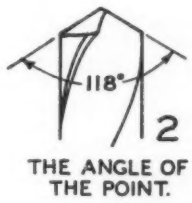
Nomenclature, Types, Sizes, and Correct Use

The twist drill is one of the most used and in many cases, the most abused metal cutting tool in our shops. The following lesson is dedicated to a better understanding of the working parts of the drill for the purpose of giving this tool a longer and more effective life.

A twist drill consists of three parts — the shank, the body, and the point.



1



2 THE ANGLE OF THE POINT.

Twist Drill Nomenclature

The shank usually is either a straight shank for use in a Jacobs chuck or hand drill, or it is a tapered shank for use in a tapered sleeve. Tapered shank drills start at ½-in. diameter and continue on up through the largest sizes. The taper on the shank is a Morse taper. This taper is standard on all drill presses and lathes. This permits the use of large size drills in either of these machines. Although there are other types of shanks, these are the most used. The purpose of the shank is to provide a means of holding and turning the drill.

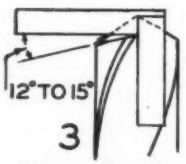
The body of the drill consists of four parts — the flutes, the web, the margin, and the margin relief or *land*. The flutes of a drill are the spiral grooves extending from the shank of the drill to the point. These flutes serve three purposes — to carry chips away from the point, to form the cutting lips, and to allow coolants or lubricants to reach the cutting lips. The web of the drill (sometimes called the backbone), separates the flutes. It terminates at the point forming the *dead center* of the drill. The margins are the raised portions that follow the edge of the flutes and terminate at the end of the cutting lips. These raised portions act as a guide in directing the drill and are the full diameter of a drill. The margin relief is the portion of a drill behind the margin that has been cut away. This margin relief acts as a clearance on the drill, permitting it to run easier and with less friction.

The point of a drill is the business end. It does the actual cutting of the metal. The point consists of the *dead center*, and the cutting lips. The dead center of a drill is the starting point of the drill. As a drill gets shorter, the web thickens, causing the dead center to become wide. This has to be thinned to permit the drill to enter the work. The cutting lips are the wedges that do the cutting. To work properly, they must be ground at the same angle and to the same length. Lip clearance must be given to the sides of the cutting lips.

Correct sharpening is essential for a round, smooth, and to size hole. For ordinary use the angle of the point should be 59 deg. on a side or 118 deg., including angle. See Figure 2.

To form the lip clearance, grind away the material behind the cutting lips so that an angle of 12 to 15 deg. is formed. See Figure 3.

As previously specified, the cutting lips must be the same angle and of the same length. Both the angle and the length may be checked with a drill angle gauge, as shown in Figure 4.



3 THE ANGLE OF LIP CLEARANCE.

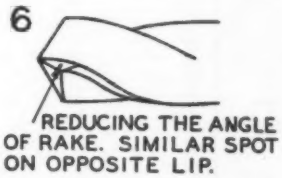
4 CHECKING ANGLE OF POINT AND LENGTH OF THE LIPS.

Figure 5 shows how to thin the web of a drill that has been shortened by long use. Hold the drill in a vertical position on the edge of a grinding wheel and grind away part of the web at the point of the drill.

For soft materials like brass, copper, and aluminum, it is necessary to decrease the angle of rake to prevent the lips from *hogging in*.

Twist drills, like all metal cutting tools, are made from either high carbon steel or high speed steel. High speed steel is expensive and these drills are used only on very hard materials or on production work.

Drills are made in many sizes ranging from 1/64 to 4 in. in diameter. The size of a drill is its diameter taken at the point across the margins. There are four systems of drill sizes in common use. They are the fractional, letter, number, and the metric system. The fractional sizes of drill start at 1/16 and go up to 4 in. by sixty-fourths. To enable one to drill a hole in between these sizes we have the number and letter drills. Number drills run from No. 1 to No. 80. Number 80 is the smallest with a diameter of .0135 in. No. 1 drill is .228-in. in diameter. Letter drills from A to Z begin with A at a diameter of .234 in., and end with Z which is .413 in. Above this size, when a hole in between the standard drills is desired, it is either bored or reamed. The last system of drill sizes is the Metric system. Drill diameters are given in millimeters. A set of these drills starts at 4mm. (.0157) and goes up to 50mm. (1.068). These are not in everyday use in our country so a knowledge that they exist is sufficient.



To obtain the correct size of a drill, a measurement may be taken with a micrometer across the margins of the drill at the point. Another method is to check the point of the drill in a drill gauge. Drill gauges are made for all four systems of drill sizes.

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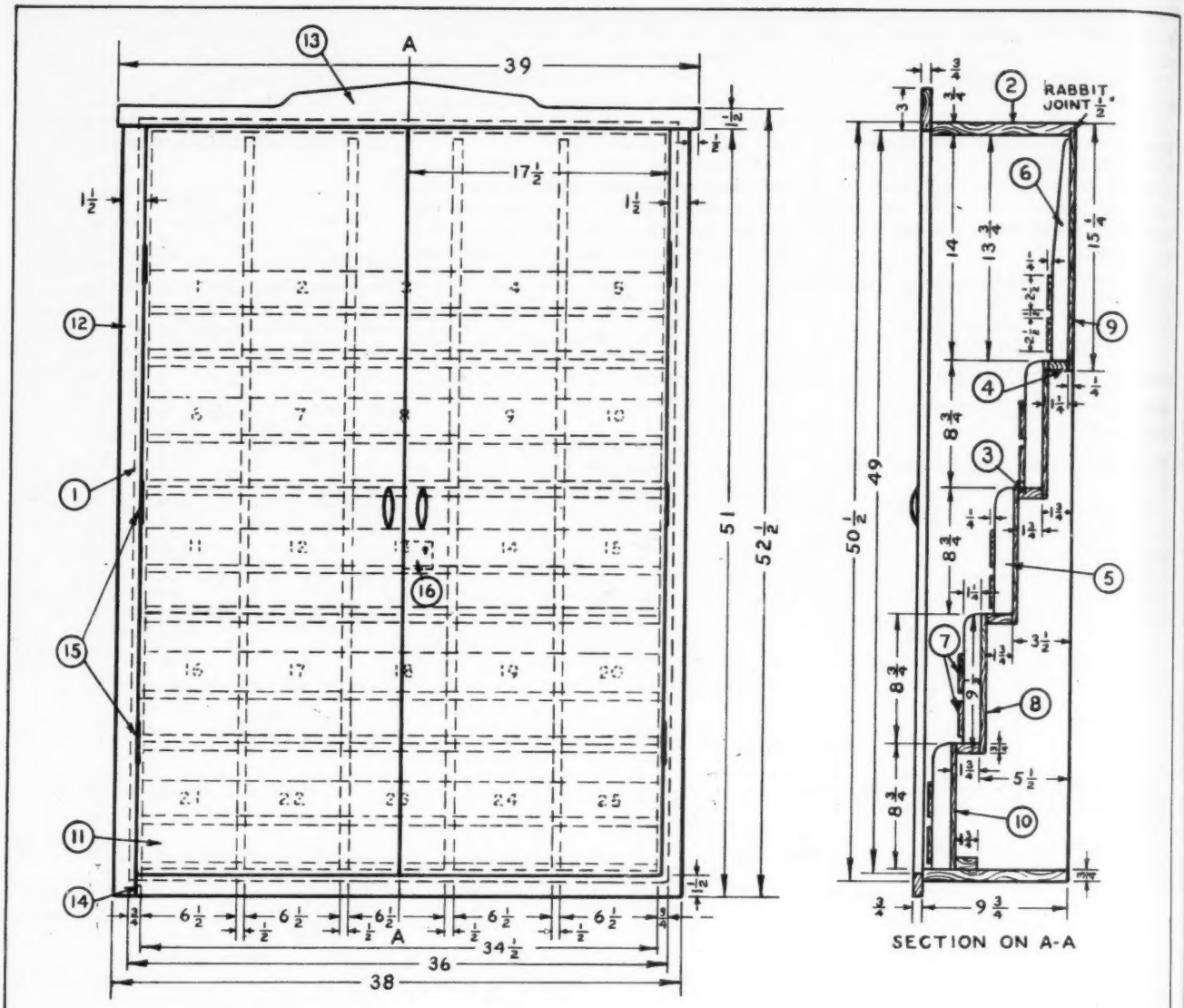
Oberg and Jones, Machinery's Handbook (New York, N. Y.: The Industrial Press).

DRAFTING EQUIPMENT CABINET

R. C. SHAW
Escanaba, Mich.

When the drafting equipment is the property of the school and rented to the students, it is difficult to check and keep in order. The boys seem to have a careless do-not-care attitude when all equipment is loaned. A boy who has his own personal set has more pride and a better sense of responsibility than the one who rents his equipment. The educational value of ownership is definitely outstanding. However, a few students might not be able to take drafting if all students were required to purchase their equipment. The argument



MATERIAL

1. SIDE PIECE - $\frac{3}{4} \times 9\frac{3}{4} \times 50\frac{1}{2}$ - 2 REQ. RED GUM	9. BACK - $\frac{1}{4} \times 15\frac{1}{4} \times 34\frac{1}{2}$ - 1 REQ. PLYWOOD
2. END PIECE - $\frac{3}{4} \times 9\frac{3}{4} \times 34\frac{1}{2}$ - 2 REQ. RED GUM	10. BACK - $\frac{1}{4} \times 8\frac{3}{4} \times 34\frac{1}{2}$ - 1 REQ. PLYWOOD
3. CROSS PIECE - $\frac{3}{4} \times 1\frac{3}{4} \times 34\frac{1}{2}$ - 4 REQ. RED GUM	11. DOORS - $\frac{3}{4} \times 17\frac{1}{2} \times 49$ - 2 REQ. PLYWOOD
4. CROSS PIECE - $\frac{3}{4} \times 1\frac{1}{4} \times 34\frac{1}{2}$ - 1 REQ. RED GUM	12. SIDE TRIM - $\frac{3}{4} \times 1\frac{1}{2} \times 51$ - 2 REQ. RED GUM
5. SEPARATORS - $\frac{1}{2} \times 1\frac{1}{4} \times 8\frac{3}{4}$ - 16 REQ. MAPLE	13. TOP TRIM - $\frac{3}{4} \times 3 \times 39$ - 1 REQ. RED GUM
6. SEPARATORS - $\frac{1}{2} \times 1\frac{1}{4} \times 13\frac{3}{4}$ - 4 REQ. MAPLE	14. BOTTOM TRIM - $\frac{3}{4} \times 1\frac{1}{2} \times 35$ - 1 REQ. RED GUM
7. SLATS - $\frac{1}{4} \times 2\frac{1}{2} \times 34\frac{1}{2}$ - 10 REQ. RED GUM	15. HINGES - $\frac{3}{4} \times 3$ BUTT - 6 REQ.
8. BACKS - $\frac{1}{4} \times 9\frac{1}{2} \times 34\frac{1}{2}$ - 3 REQ. PLYWOOD	16. LOCK - 1 REQ.

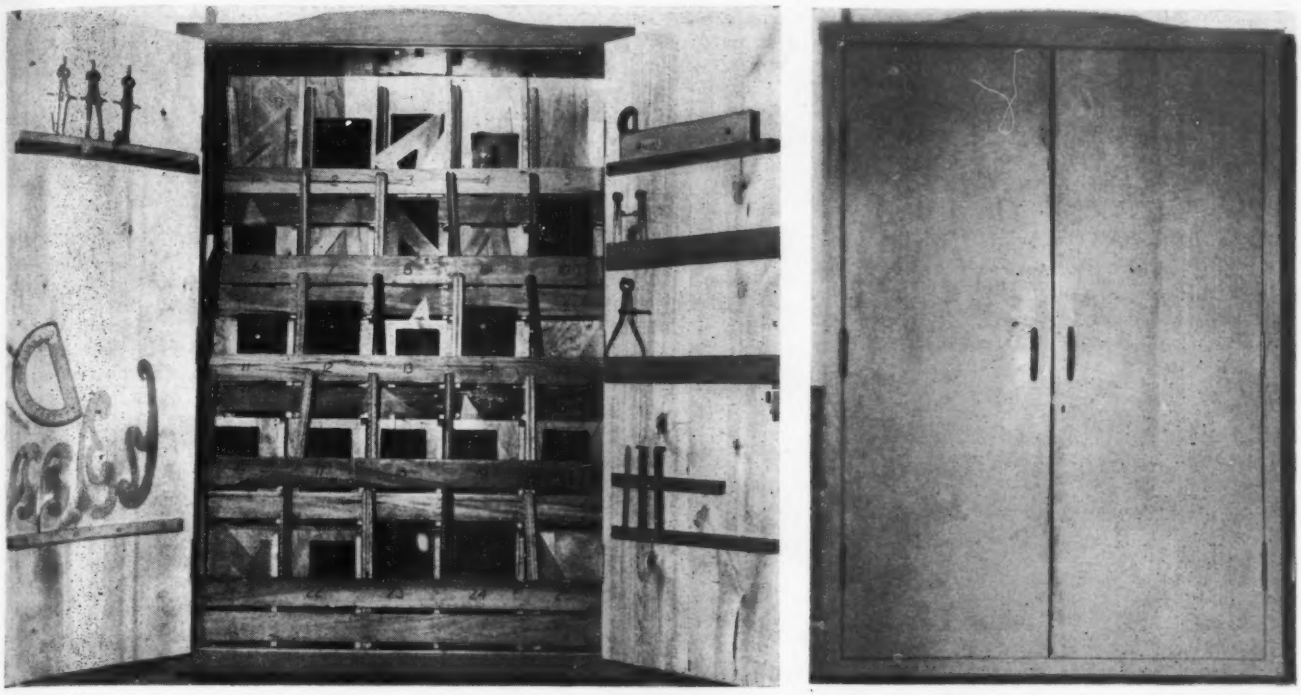
NOTE: ASSEMBLED WITH SCREWS AND GLUE

Details of drawing-instrument cabinet

for rental or ownership could be arbitrated by having equipment to loan the elementary students in the tryout course and those who take the advanced work purchasing their own.

The difficulty of securing good drafting sets and the advance in price make the problem more important.

When the drawing instruments are stored in the drawers of the drawing tables, some students lose their keys and they pick the locks and soon ruin them. To check the instruments when five or six different boys use



Drawing-instrument cabinet shown in open and closed position

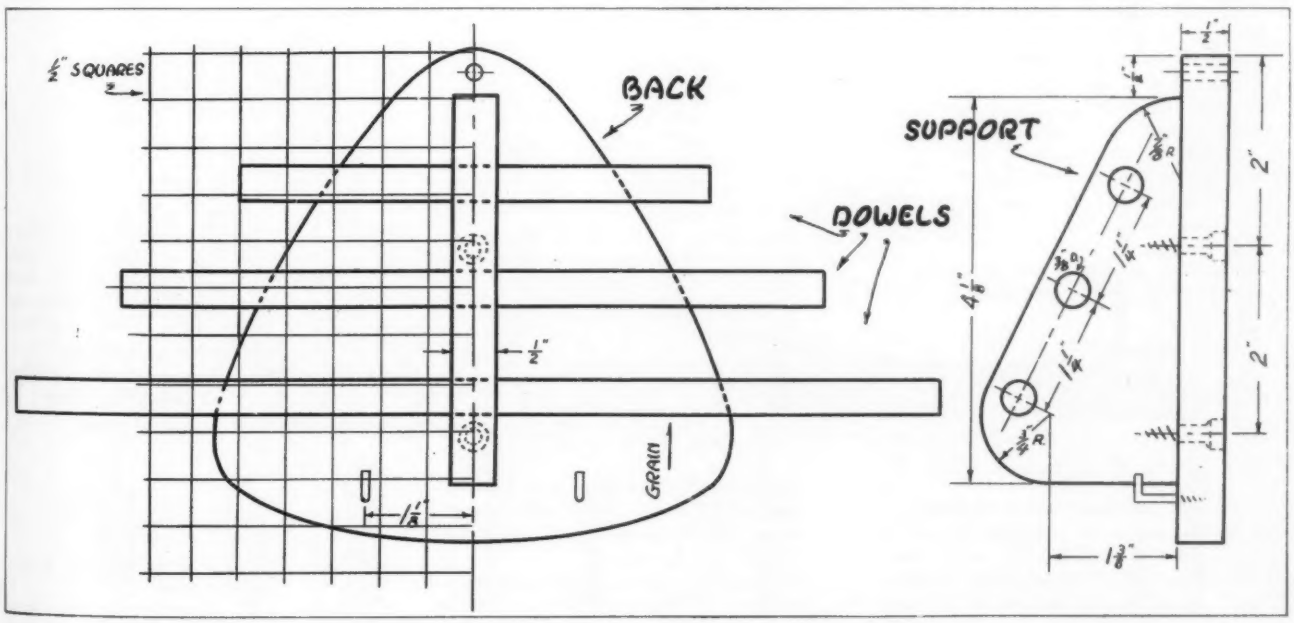
the same set each day is quite a task. The sets soon get out of order and the students start borrowing parts from other sets, making it difficult to check the careless students.

The cabinet shown and described herewith displays the equipment so the instructor can check the sets at a glance. The 25 pockets are 6½ by 1¼ in., and each will hold the drafting set, two triangles, and scale. Instruments and pockets are numbered to correspond with the students' desks. The doors of the cabinet may be utilized to display the extra equipment such as curves, protractors, large angles, calipers, micrometers, etc.

PAINT WITH LIGHT

Modern luminous paint is easy to apply to almost any surface usually found around the home, farm, summer camp, or in industries using cloth, glass, leather, metal, paper, or wood. It can be brushed, sprayed, stenciled, or screened to make pictures, signs, flashlights, switch plates, fire extinguishers, furniture, and other objects or obstacles glow in the dark.

— *The New Jersey Zinc Co.*



Modern tie rack. Submitted by R. W. Swinyard, State Teachers College, Oswego, N. Y.

AERONAUTICS

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(Continued from page 382 of the November, 1948, issue)

UNIT X

Communications

Word list for communications unit:

1. semaphore
2. atom
3. molecule
4. nucleus
5. proton
6. electron
7. neutron
8. conductor
9. insulator
10. cathode tube
11. vacuum tube
12. galvanometer
13. grid
14. filament
15. alternating current
16. direct current
17. rectifier
18. transformer
19. filter choke
20. condenser
21. dynamotor
22. generator
23. oscillator
24. audio frequency
25. radio frequency
26. frequency
27. wave length
28. carrier wave
29. modulation
30. microphone
31. amplifier
32. antennas
33. radio range

I. Ways of sending messages

A. Radio communications
   1. Phone (voice)
   2. Code (teletype)

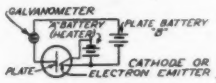
B. Visual signals
   1. Blinker lights. Flashes instead of sound relay the international Morse code.
   2. Semaphore. Two-flag system entirely.
   3. Airport or carrier flag signals.
   4. Signal lights and flares.

C. Operation of radio equipment (receiving set, transmitter, and radio compass)
   1. International Morse code. Army regulation of twenty words per minute.

II. Principles of radio

A. Nature of matter and electricity
   1. The structure of matter
   2. Atomic structure
      a) Nucleus
      b) Proton
      c) Electron — 1/1845 weight of a proton but has the same amount of charge
      d) Neutron
   3. Electrical attractions and repulsions
   4. Conductors, insulators, and electric current
      a) Electric current is caused by removal of electrons from one atom to another by a conductor.
      b) Flow of electrons retarded in air, glass, wax, and rubber. These substances, therefore, are called insulators.
      c) Heat increases electronic motion.
      d) The cause of electronic motion is called *potential* — not to be confused with *current* which is determined by the number of electrons that pass a given point on a wire per second.
   5. Electric current without wire
      a) In radio tubes or in other vacuum tubes called cathode tubes, the electrons will move without a wire to conduct them because of the removal of the insulator which is air. The electrons are freed by the high voltage of the induction coil.

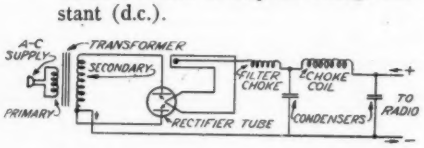
B. How does a radio tube work?
   1. Electrons leave the hot metal (cathode) and are attracted to the plate. They are then measured on the galvanometer, pass through the B battery and back to the cathode. The B battery gives the plate a positive charge. The A battery is a negative charge.



   2. The third element in a radio tube is a grid.
      a) A grid is composed of several turns of fine wire placed between the cathode and the plate. It is valuable as a control for the electronic flow.
         1) Small variation in voltage applied to the grid causes a large change in the plate circuit.
         2) A simple radio receiving set can be made by connecting wires which will bring in radio signals to an electron emitter and an A battery and a pair of earphones in place of the galvanometer.

C. How alternating current is used to free electrons
   1. The temperature of the filament fluctuates so much that it causes a loud hum due to the fluctuations in the electron stream.
   2. To get away from this hum a thin metallic sleeve is placed around the filament (also insulated from it). The filament wire is fairly heavy and tends to maintain an even temperature and the cathode or metallic sleeve is indirectly heated by it and has no alternating current going through it and emits electrons steadily because it is direct current.

D. Battery substitute
   1. The cathode can be heated by alternating current but the voltage applied to the plate must always be constant so a rectifier is used to keep the voltage constant (d.c.).



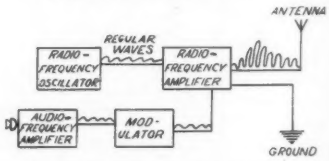
   2. The filter circuit (filter choke and condenser) smooths out the relatively unsteady direct current and makes it useful for a radio tube.
   3. Vibrator (rectifiers) in airplanes, transmitters, and receivers must have some means of changing a low direct current to a high voltage direct current. These devices contain magnetically operated contacts which open and close the primary circuit of a step-up transformer and also reverse the direction of the battery current in that primary. It is the same as applying a.c. to the primary, that is, a high voltage is built up in the secondary of the transformer and this is rectified the same as just described.
   4. A dynamotor is a low voltage electric motor and a high voltage d.c. generator in one unit. A small gasoline engine drives the a.c. generator on the larger planes.

E. How are radio messages sent or broadcast?
   1. Radio waves are produced by radio frequency oscillators which work on the principle that a radio tube can be made to generate a current which fluctuates from positive to negative very rapidly (high frequency).
   2. Current is generated by feeding back some of the energy of the plate circuit into the grid circuit. Frequencies run as high as 500,000,000 waves per second.
   3. Relationship between frequency of wave disturbance and the length of the individual wave. Wave is always traveling at 186,000 miles per second or thirty billion centimeters per second.

$$\frac{30{,}000{,}000{,}000}{500{,}000{,}000} = 60$$ centimeters or approximately two feet (wave length)

Commercial broadcasting is done on wave lengths of approximately 30,000 centimeters or 300 meters.

   4. Radio transmitters
      a) The frequency or length of a wave length can be adjusted by changing the adjustment of the coils and condensers to produce the exact wave desired. This is called a carrier wave and can be interrupted by a key to send dots and dashes.



      b) For phone transmission it is necessary to alter the shape of the carrier wave so that the over-all outline of the modified wave will follow the sound wave of the spoken word. This process is called modulation.
   5. Microphone devices for converting sound energy into electrical energy
      a) Carbon
      b) Dynamic
      c) Crystal
      d) Velocity
      e) Condenser

F. Receiving radio messages
   1. Radio receivers. Most generally known is the superheterodyne.
      Incoming wave received by the antenna and is amplified by the radio-frequency

(Continued on page 18A)

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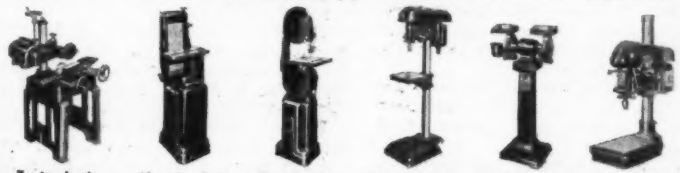

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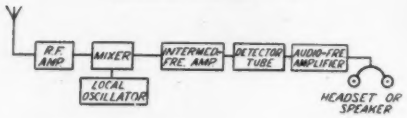
AERONAUTICS

(Continued from page 422)



amplifier. The signal is then passed on to the mixer tube. The wave is superimposed with another wave of a different frequency produced in the local oscillator circuit. After the signal passes through the intermediate-frequency amplifier it is still vibrating at radio frequency which is too high for the human ear to respond to. The detector tube eliminates the lower half of the radio-frequency wave and passes the rectified current on to the audio-frequency amplifier in the form of a pulsating d.c. This current is further amplified here and converted to sound waves by the earphones or the loud-speaker.

2. Antennas used are:
   a) Loop
   b) Whip — best performance under the plane
   c) Trailing
   d) T type
   e) Inverted L

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1. Radio ranges and range flying
   a) Letters *A* and *N* used to show which quadrant of the circle the plane is flying in. Over the airport there is a *cone of silence* and flying on the beam is noted by a continuous sound broken only by station letter identification. Loop antennas work best for these signals.

2. Radio compass is based on the principle that antennas transmit most of their energy in one direction. Loop antennas are highly directional.
3. Radio altimeter. Radio waves are sent out and the time for them to rebound from the earth or surrounding terrain determines the altitude. This instrument is sometimes called a terrain clearance instrument. It is better than a regular altimeter which uses sea level as the base.

(To be continued)

In World War II, free enterprise America — with less than 10 per cent of the globe's resources, population, and area — produced half of the guns, munitions, ships, bombs, and bullets that enabled Russia, England, France, and other allies to conquer the Axis nations. — *Capt. Eddie Rickenbacker.*

Personal News

VOCATIONAL EDUCATION LEADER APPOINTED HEAD OF YOUTH COMMISSION

Dr. William F. Rasche, director of the Milwaukee Vocational School, was appointed head of the youth committee by Mayor Zeidler of Milwaukee. Dr. Rasche was authorized to appoint the other six members of the commission.

They are: Mrs. C. R. Beck, chairman of the special citizens' committee on the detention home and juvenile court; Mrs. Woods O. Dreyfus, a member of the Milwaukee school board and president of the 4th and 5th district of the Parent-Teacher Association; Miss Alice Holz, vice-president of the International Office Workers' union (AFL) and member of the Intergroup Council of Women as Policy Makers; Miss Gertrude Puelicher, youth chairman of Town Hall of Milwaukee and member of the metropolitan crime prevention commission; the Rev. Thomas B. Lyter, pastor of the Washington Park Presbyterian church and a member of the mayor's committee on human relations; August Reisweber, chairman of the fire and police commission and the metropolitan crime prevention commission.

The purpose of this commission is to put into effect "an action program" to reduce juvenile delinquency.

♦ Dr. Walter B. Jones, associate professor of vocational education at the University of Pennsylvania, Philadelphia, Pa., has returned to his professorial duties after having spent a year as consultant in charge of the industrial-teacher-education program at Rio de Janeiro, Brazil.

♦ Dr. Verne C. Fryklund, president of The Stout Institute, Menomonie, Wis., returned recently from Japan where he served in setting up certification standards for Japanese vocational teachers, and in organizing four-year curriculums for Japanese vocational schools.

♦ Dr. J. Bryan Kirkland, formerly head of the department of agricultural education at the University of Tennessee, has been appointed dean of the school of education of North Carolina State College, Raleigh, N. C.

Dr. Kirkland received his B.S. and M.S. degrees at the University of Tennessee, and his Ph.D. at Ohio State University.

He has served in the department of agricultural education at the University of Tennessee since 1929.

♦ Dr. Lynne C. Monroe has been appointed chairman of the industrial-arts department of Santa Barbara College, University of California, Santa Barbara, Calif.

♦ Professor E. E. Ericson, formerly chairman of the industrial-arts department, Santa Barbara College, University of California, Santa Barbara, Calif., has been appointed assistant director of the University Extension Division. He will also continue as professor of industrial arts.

♦ Fred J. Jeffrey, principal of Hadley Technical High School, St. Louis, Mo., retired on his seventieth birthday at the close of the school term. He has been in the school service of that city since 1904. He served for a time as assistant superintendent of education.

♦ E. H. Kemper McComb retired June 30, 1948, from the principalship of Emmerich Manual Training School, Indianapolis, Ind. He was on the school faculty for 48 years.

♦ Dr. Fred W. Hosler, formerly superintendent of schools in Allentown, Pa., has been appointed superintendent of schools in Oklahoma City, Okla.

♦ Leland A. Benz, formerly metalwork instructor at Maine Township High School, Park Ridge or Des Plaines, Ill., has been appointed director of the vocational-technical division at Pueblo Junior College, Pueblo, Colo. Mr. Benz assumed his new duties on September 13, 1948.

He obtained his B.S. and M.S. degrees from Iowa State College. He was head of the industrial-arts department in the Ames High School, and during the war was granted a leave of absence to take over duties as instructor in the naval training program at Iowa State College. Later at Oskaloosa, Iowa, he was co-ordinator of trade and industrial education, and head of the industrial-arts department in the high school.

♦ George T. Lilly, B.S., and M.A., Western State College, Bowling Green, Ky., has joined the industrial-arts staff at Murray State College, Murray, Ky. Mr. Lilly formerly taught industrial arts in the Charlotte, N. C., and Alcoa, Tenn., school systems. He also served four years in the navy as a seagoing officer. He was discharged as a lieutenant, sr. grade.

♦ Robert W. Innis has assumed his duties as superintendent of schools at Williamsburg, Mich. Mr. Innis is a former rural teacher of Kalkaska County, Mich. He received his B.S. in industrial arts from Central Michigan in 1942, and his M.S. in industrial education from The Stout Institute in January, 1948. The spring semester of 1948 was spent working toward the Ph.D. at the University of Michigan.

♦ Alan R. Pawelek, assistant professor of industrial arts, Ball State Teachers College, Muncie, Ind., spent the summer completing the course work for a doctor's degree at the University of Minnesota.

♦ Robert H. McGinnis, instructor of industrial arts, Burris Laboratory School, Ball State Teachers College, Muncie, Ind., received the master's degree from The Stout Institute, Menomonie, Wis., this summer.

♦ William Hickman has been appointed teacher of industrial arts at North Terre Haute, Ind.

♦ Phil Ruehl, who received a master's degree at the end of the past summer session at The Stout Institute, Menomonie, Wis., was appointed instructor of electricity at that institution.

♦ Dr. Stuart Anderson, an instructor of education at The Stout Institute, received his Ph.D. degree this summer at the University of Wisconsin. He majored in political science.

♦ Ralph E. Duso, formerly head of the industrial-arts department at Roger Ludlow High School, Fairfield, Conn., has joined the department of industrial arts at the Gorham State Teachers College, Gorham, Me.

Mr. Duso received his B.S. degree from the Keene State Teachers College, Keene, N. H., and his M.E. degree from New York University. He has been president of the Connecticut Industrial-Arts Association for the past two years, and vice-president from Connecticut in the New England Industrial-Arts Association.

♦ John M. Pollock has assumed his duties as assistant professor of industrial arts at the University of Georgia, Athens, Ga.

Mr. Pollock is a native of Oklahoma and received the B.S. and M.S. degrees from Oklahoma A. & M. College with a major in industrial arts education.

♦ Victor Nix has been appointed instructor in the demonstration school of the University of Georgia. He will be in charge of industrial arts.

Mr. Nix received the B.S. degree with a major in industrial arts from the University of Georgia in the summer of 1948.

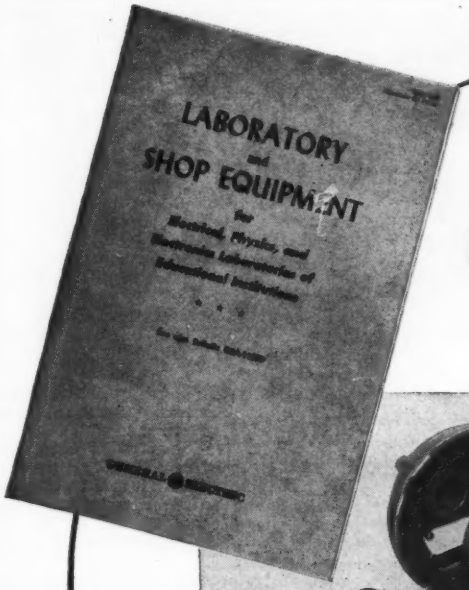
♦ Col. John Slezak, president of the Turner Brass Works, Sycamore, Ill., has been elected to membership on the board of trustees of Illinois Institute of Technology.

Col. Slezak is chairman of the board of Kable Brothers Co., Mt. Morris, Ill., a director of the Whiting Corporation, Illinois Bell Telephone Company, Felt & Tarrant Mfg. Company, and the Burgess-Norton Mfg. Company.

He is a director of the American Ordnance Association and the president of its Chicago post.

He is also a director of the Illinois Manufacturers' Association, and the Illinois State Chamber of Commerce.

(Continued on page 20A)



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(Continued from page 18A)

♦ HERSCHEL FREDERICK EASTMAN and B. WAYMOND FERGUSON received their master's degrees at Ball State Teachers College, Muncie, Ind., with majors in industrial arts, on June 1, 1948.

♦ DR. RAY M. STOMBAUGH, head, department of industrial arts, Illinois State Normal University, Normal, Ill., was guest professor in the industrial-arts department, Ball State Teachers College, Muncie, Ind., teaching graduate work during the first summer session.

♦ ERNEST EBRITE, head, department of industrial arts, McKinley Junior High School, Muncie, Ind., again assisted in the summer sessions of the industrial-arts department, Ball State Teachers College, Muncie, Ind.

♦ OLIVER C. BUMB, assistant professor of industrial arts, Ball State Teachers College, Muncie, Ind., resumed his graduate work at Indiana University during the past summer session.

♦ HENRY A. LOATS, assistant professor of industrial arts, Ball State Teachers College, Muncie, Ind., is on leave of absence to complete his graduate work at Ohio State University.

♦ The registrar of The Stout Institute, Menomonie, Wis., reports placement of the following graduates, at the institutions indicated: EDWARD MULLER, Georgia Tech., Atlanta, Ga.; ELMER RUDIGER, Berry Schools, Mt. Berry, Ga.; DOUGLAS SANDORO, Alabama Tech., Auburn, Ga.; JOHN TEIGEN, Alabama School of Trades, Gadsden, Ga.; HAYDEN CARMICHAEL, State Teachers College, Fairmont, Va.; ROBERT INNIS, superintendent of schools, Williamsburg, Mich.; LENO CARADORI, Boys Town, Neb.; CHARLES GAVIN, Junior College, Coleraine, Minn.; JACK HELLUM, industrial arts and co-ordination, Salisbury, S. C.

♦ LESTER B. KESTERTON, formerly a research assistant in industrial education at the University of Missouri, received his master's degree in August, and is now serving as co-ordinator for a program of diversified occupations at Nevada, Mo.

♦ LESTER L. FEHR, director of vocational and adult education at Allentown, Pa., was promoted to the positions of assistant superintendent and director of vocational and adult education.

♦ LEONARD M. MILLER, Havertown, Pa., formerly director of the veterans advisement center, Temple University, has been appointed specialist for counseling, pupil personnel, and work programs of the U. S. Office of Education. He assumed his new duties in June.

♦ W. A. BROTHERTON, a graduate of Memphis State College, has been appointed teacher of architectural drawing at the Memphis State College, Memphis, Tenn.

♦ R. L. SHIRLEY, formerly instructor at the Junior College, Martin, Tenn., will teach engineering drawing, at the Memphis State College, Memphis, Tenn.

♦ THOMAS W. YOUNG will teach vocational machine shop and industrial-arts machine shop at the High School, Peru, Ind.

♦ R. G. (DICK) ASHBAUGH has joined the teaching staff at the North Junior High School of Colorado Springs, Colo. He will teach metalwork, electricity, and auto mechanics. Mr. Ashbaugh taught industrial-arts courses at the Sherman County High School in Goodland, Kans., for the past two years.

♦ DAVID NICHOLSON, for several years personnel manager of the Sunnen Products Company in St. Louis, Mo., received his doctor's degree in industrial education at the University of Missouri in June, and has returned to his position with Sunnen Products Company. Dr. Nicholson's dissertation was entitled "Why Adults Attend School—An Analysis of Motivating Factors." His dissertation is being published as an adult education bulletin by the University of Missouri.

♦ MORRIS M. RICHARDS, instructor of industrial arts at Michigan State College, Ypsilanti, Mich., has been granted a leave of absence and is now teaching part time at the University of Missouri and pursuing graduate work toward his doctor's degree in industrial education.

♦ RODERICK KOHLER of the Illinois State Teachers College, DeKalb, Ill., and his twin brother, Richard Kohler of the Southern Illinois State University, Carbondale, Ill., were graduate students at the University of Missouri during the 1948 summer session. Both were working on their doctor's degrees in industrial education.

♦ BERNARD S. PARMET, has been appointed instructor in electrical engineering at Illinois Institute of Technology.

Mr. Parmet was graduated from John Marshall high school in 1940, attended Herzl Junior College, received his bachelor's degree in 1944 and his master's degree from Illinois Tech in 1948.

In addition to his teaching duties, Mr. Parmet is working toward a Ph.D. degree.

♦ RAY WALLIS received his master's degree in industrial education at the University of Missouri in August, and has returned to his position as teacher of industrial arts at Orlando, Fla.

♦ WILLIAM CASWELL has joined the staff of the industrial-arts department of the Millersville, Pa., State Teachers College. His duties will be mainly those of supervising practice teaching. Mr. Caswell is a graduate of Mansfield, Pa., State Teachers College, the Ohio State University, and is working toward the doctorate at Pennsylvania State College.

♦ The following men received the master's degree in education with a major in industrial education in September of this year, at Wayne University, Detroit, Mich.:

LEONARD STORY DAVIS, HAROLD CHRISTIAN HILL, AUSTIN WILLIAM JEPSON, PAUL A. LUOMA, JAMES EDWARD MOSBY, JR., EDWIN WEISS POLK, WILLIAM G. SLOAT, and ROBERT VEAR SWEARINGEN.

♦ DONALD F. HACKETT, formerly of the Murray State Teachers College, Murray, Ky., has been made chairman of the Division of Fine and Applied Arts, Georgia Teachers College, Collegeboro, Ga. Mr. Hackett received his master's degree in industrial education from the University of Missouri.

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FORMING ALCOA ALUMINUM—*64 pages; 21 illustrations; 11 tables*—Explains the fabrication of aluminum and magnesium by blanking and piercing, drawing, spinning, shape forming, embossing, coining and stamping. Discusses the forming characteristics of the various aluminum alloys.

ALCOA ALUMINUM AND ITS ALLOYS—*156 pages; 25 illustrations; 88 tables*—Fundamental information concerning the many Alcoa Aluminum Alloys. Data in tabular form on their chemical and physical properties as well as the tolerances and sizes of all commercial forms.

RIVETING ALCOA ALUMINUM—*56 pages; 19 illustrations; 19 tables*—Detailed information on riveting aluminum and its alloys. Covers strength and proportions of riveted joints, driving methods, and selection of rivet alloy. Also, brief account of aircraft riveting.

FINISHES FOR ALCOA ALUMINUM—*64 pages; 60 illustrations*—A handbook which discusses the many kinds of finishes that can be applied to aluminum by mechanical, organic, chemical, electrochemical, and electroplating methods. 4-color plates show actual finishes.

WELDING AND BRAZING ALCOA ALUMINUM—*134 pages; 52 illustrations; 18 tables*—Complete information on torch, arc, resistance welding, and brazing of aluminum. Includes a discussion of the recently developed tungsten-arc welding method. Six full-color illustrations of welding flame adjustments.

CASTING ALCOA ALLOYS—*142 pages; 29 illustrations; 16 tables*—General foundry principles, including melting, molding, and finishing. A complete description of the various aluminum casting alloys is listed in convenient forms.

MACHINING ALCOA ALUMINUM AND ITS ALLOYS—*68 pages; 21 illustrations; 6 tables*—Useful information on tools best fitted for machining, drilling, reaming, tapping and threading, sawing and filing aluminum; speeds and feeds; and general machining practice.

Which of these books and visual aids do you need? They will prove invaluable to any teacher whose students are working with aluminum. Below is additional material, useful for general background information on aluminum. All teaching aids described on this page sent free to industrial arts teachers. Write ALUMINUM COMPANY OF AMERICA, 1773 Gulf Bldg., Pittsburgh 19, Pa.

Aluminum—Its Story. Written in nontechnical style for Junior High School students. Tells how aluminum is made, its history and uses, 48 pages, illustrated.

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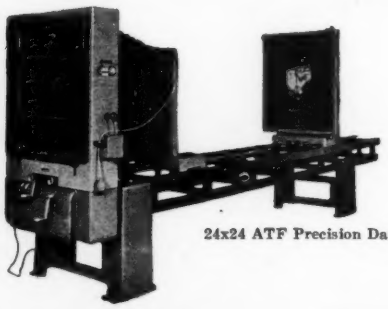

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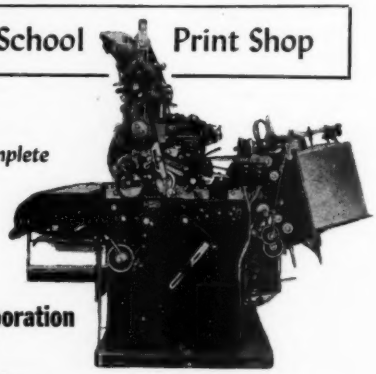

ATF Chief 22 Offset Press

Association News

A.V.A. CONVENTION

The 1948 convention of the American Vocational Association will be held in Milwaukee, Wis., on November 30, and December 1, 2, 3, and 4, 1948.

This will be the annual convention of this organization. Milwaukee is an ideal place for holding the convention, for the visitor has practically unlimited opportunities to visit industrial plants; business establishments; grade, junior high, senior high, technical high, trade, and part-time and full-time vocational schools.

Besides the Milwaukee schools, those in West Allis, Cudahy, Shorewood, and South Milwaukee can be reached readily.

Dr. William F. Rasche and his planning committee have given assurance that every detail of the arrangements has been carefully carried out.

Abstracts from the program follow.

Industrial-Arts Section

At the Wednesday morning meeting the theme of which is "Improving Industrial Arts Teacher Education," Thomas Hippaka, director of industrial arts teacher education, Iowa State College, Ames, Iowa, will be the chairman.

Lynn Monroe, Cecil R. Hutchcroft, and G. Harold Silvius will discuss the subject, and K. F. Perry will be the discussion leader.

The theme for the Wednesday afternoon meeting will be "The Industrial Arts Curriculum." The chairman of the meeting is Gordon O. Wilber, director of industrial arts teacher education, State Teachers College, Oswego, N. Y.

The speakers are V. L. Pickens, Roy A. Radtke, and R. Lee Hornbake, and Wesley Ketcham will lead the discussion.

Industrial arts in the national picture will be discussed at the Thursday afternoon meeting by Ross Spalding and John R. Ludington.

Friday morning safety and organization will be the subject for discussion.

Louis V. Newkirk, director, industrial arts, Chicago, Ill., will act as chairman.

The speakers on the program will be Raymond Stombaugh, DeWitt Hunt, and K. R. Beckman.

The business meeting of the industrial-arts section will be held Friday afternoon, at which time E. E. Ericson, professor of industrial arts, University of California, Santa Barbara College, Santa Barbara, Calif., will give a report of the policies and planning committee.

At the Saturday morning session Clyde A. Bowman, dean, The Stout Institute, Menomonie, Wis., will be chairman.

Shop demonstrations and methods in leathercraft, graphic arts, Keene cement, and aluminum will be presented by Ray F. Kranzusch, Wm. R. Baker, and Roy A. Radtke.

Industrial Education Section

The program of the National Association of Industrial Teacher Trainers has already been published on page 16A and 18A of the November, 1948, issue. It will, therefore, not be repeated here.

The National Council of Local Administrators will hold a meeting Monday morning at 8 a.m.

Jesse F. Rees, president, Harrisburg, Pa., will be the chairman, and Howard E. Marvin, Pasadena, Calif., will preside at the discussion of the topic, "Evening Trade Extension and Veteran's Training."

Monday afternoon, under the chairmanship of Jesse F. Rees, the theme, "Trade and Industrial Education," will be discussed, and at the evening meeting Frank Huffaker, Chattanooga, Tenn., will speak on "Distributive Education and Other Responsibilities of a Director of Vocational Education."

At the Tuesday morning session, under the chairmanship of C. L. Wetzel, vocational teacher trainer, Hadley Technical High School, St. Louis, Mo., the following topics will be discussed: "Analyzing and Determining Training Needs in the Area of Management Personnel," "Training Supervisory Personnel," "A State Program of Supervisory Training," "Upgrading Supervision Through Training," and "The Texas program of Supervisory Training."

The National Association of State Supervisors of Trade and Industrial Education will have a meeting on Monday afternoon.

Edward M. Claude, president; and chief, trade and industrial education, Springfield, Ill., will act as chairman. The speakers will be Walter Cooper, L. S. Hawkins, Lee W. Ralston, and C. E. Turner. They will discuss preparatory programs, planning for training and work experience, criteria for crediting work experience of teachers for the single salary schedule, and for college credit. Supervisory training in industry, also, will be discussed.

The American Association of Technical High Schools and Institutes will hold its meeting on Tuesday afternoon.

W. N. Fenninger, president; and state supervisor of technical education, Albany, N. Y., will be chairman.

Robert W. Mayer, George W. Morgenroth, and Walter J. E. Schiebel will be speakers on the general subject, "Technical Education Meets the Modern Industrial Needs."

Edward Berman will be the discussion leader.

At the general session of the industrial education division, Wednesday afternoon, Russell K. Britton, director of vocational education, Denver Public Schools, Denver, Colo., will be chairman of a meeting at which the implications, requirements, and further developments in connection with the George Barden Act will be discussed.

(Continued on page 25A)

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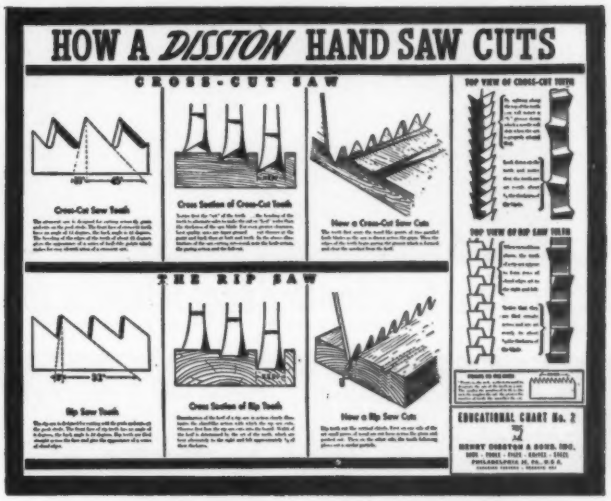

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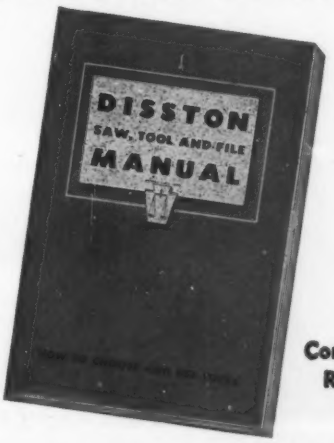
DISSTON PRACTICE FILING BLADES (Cross-cut on one edge, Rip on the other) will give your students saw-filing practice at minimum cost. Only $1.65 per dozen net, including postage.

ALSO FREE
NEW EDITION DISSTON SAW, TOOL AND FILE MANUAL

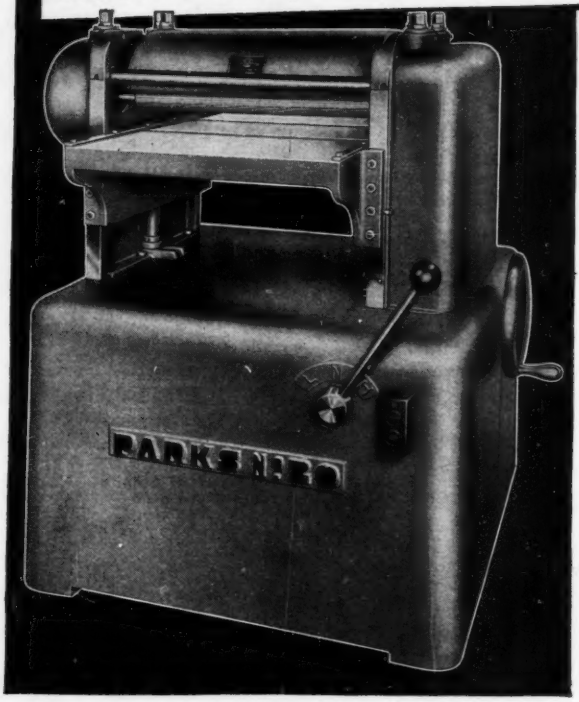


Completely Revised

HENRY DISSTON & SONS, INC., 1238 Tacony, Philadelphia 35, Pa., U.S.A.

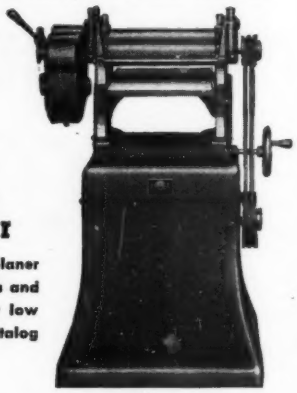
In Canada, write: 220 Fraser Ave., Toronto 1, Ont.

The Sensationally NEW Low-Priced



PARKS No. 20 20" PLANER

Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for every shop and industrial plant requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds — 20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.



The PARKS Heavy-Duty 12" x 4" Planer

A compact, sturdy, thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive catalog sheet.

The PARKS WOODWORKING MACHINE CO., Dept. 22-S, 1546 Knowlton St., Cincinnati 23, O.

Automatic Saw Filing trains your students . . . Doubles Life of Saws

"ONE OF THE BEST MACHINES WE HAVE FOR TRAINING PURPOSES" —Samuel Gompers Trades School, San Francisco

FOLEY SAW FILER

Makes Old Saws . . .

Turn Out Like New!

THE FOLEY is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster truer, cleaner — stay sharp longer.

With a Foley Automatic Saw Filer you can sharpen your saws more perfectly than is possible by hand. You can do it quicker — and your saws will stay sharp longer. Your students will turn out better work with sharp saws. ALSO by keeping your saws sharp with a Foley — you will easily double their cutting life and have less breakage, reducing replacements to a minimum.

30-DAY TRIAL OFFER. You may have the privilege of using a Foley Saw Filer in your own shop for 30 days — and see for yourself its training advantages and operating economies. Send coupon for details.

TYPICAL SCHOOL USERS

Berea College, Berea, Ky.
Board of Education, Cleveland, Ohio
Boys Technical H. S., Milwaukee, Wis.
Charleroi School District, Charleroi, Pa.
Redlands Public Schools, Redlands, Calif.
Stout Institute, Menomonie, Wis.

FOLEY Automatic SAW FILER

FOLEY MFG. CO., 3318 N.E. 5th St., Minneapolis 18, Minn. Please send literature on the Foley Automatic Saw Filer and details of your 30-Day Trial.

Name .....

Address .....

School .....

(Continued from page 22A)

Walter H. Cooper, Clarence L. Greiber, and Green B. Trimble, are the speakers who will present the subject on the national, state, and local level.

On Wednesday afternoon the technical high school division will discuss for whom terminal technical education is projected and by whom it is to be administered.

Walter J. E. Schiebel, principal, N. R. Crozier Technical High School, Dallas, Tex., will be the chairman. The speakers will be W. E. Stirton, G. H. Parkes, L. L. Jarvie, and R. W. Howes.

The discussion will be led by Dr. L. A. Emerson.

On Thursday afternoon, sessions on safety, part-time education, graphic arts, and building trades will be held.

On Friday there will be sessions on automobile mechanics, visual aids, apprentice training, and electronics.

Vocational guidance sessions are scheduled for Wednesday and Thursday afternoons, and for Friday and Saturday mornings.

Agricultural Education

The agricultural education sessions will be held Tuesday, Wednesday, Thursday, Friday, and Saturday mornings, and Wednesday, and Thursday afternoons.

The topics for discussion are "Training and Upgrading Instructors for Vocational Agriculture," "Developing Vocational Agriculture," "Studying Policies and Programs," "On-the-Farm Training," "Training Veterans for Farming," "National Agricultural Organizations," "The FFA as an Aid to Vocational Agricultural Instruction," and "Constructive Co-operation."

The National Association of State Supervisors of Distributive Education will hold meetings on Tuesday and Wednesday afternoon, and on Wednesday, Thursday, and Friday mornings.

The topics for discussion are: "The Importance of Distributive Education," "The Past, Present, and Future of this Type of Education," "Business and Distributive Education," and "What's Ahead for Teachers of Distributive Education."

♦ Theta chapter of the Epsilon Pi Tau fraternity at The Stout Institute, Menomonie, Wis., held an initiation and banquet recently, at which the following men were admitted to membership: Edward W. Ahrens, William D. Amthor, James W. Bergstrom, Robert W. Blaesing, James W. Bohn, Sheridan T. Bracken, Robert A. Browley, Robert P. Desmarais, Arthur B. Deitrich, Lloyd R. Gannegan, John E. Hansen, Robert G. Hurd, Lee A. Iverson, Gustav Janssen, Phillip G. LaBorde, Paul F. Larsen, Dellmont R. Lindbloom, Richard P. Maleszewski, Merlin R. Moore, Warren F. Phillips, Edwin C. Schattschneider, Frank E. Schroeter, Gordon B. Wasinger, Robert L. Yorkston.

The initiation team consisted of Dean Clyde A. Bowman, President Omer Benn, Phillip Ruehl, George Zimmerman, Stephen Grudichak, Raymond Cornwell, Kenneth Schank, and Warren Thomas.

Dr. Fryklund, laureate member of the fraternity, spoke on the subject of vocational education in Japan. He displayed workbooks and drawings that he had acquired during his survey in that country.

Dean Bowman, laureate member and trustee of Theta chapter, gave a preview of the year's work for the chapter. Omer Benn, president of Theta chapter, acted as scoutmaster. Burton E. Nelson, former president of The Stout Institute and one of 15 living honorary members of Epsilon Pi Tau, was present.

♦ The Connecticut Industrial Arts Association held its annual fall meeting in Hartford, on Friday, October 29, 1948. Walter McAndrews of Hartford was the chairman of the program.

The general theme was "Education for Living in an Industrial Democracy," and the main speaker at the luncheon, which was held at the Hotel Guard at 12:30 p.m., was Dr. John R. Luddington, specialist in industrial arts, Division of Secondary Education, U. S. Office of Education. A business meeting followed the luncheon.

♦ The industrial-arts section of the Southwest Wisconsin Education Association met in the library of the industrial-arts building at the Teacher's College, in Platteville, Wis., on October 1, 1948.

H. A. Pederson, director of the department, and chairman of the meeting, was in charge.

Dr. Wm. J. Micheels, associate professor of industrial education of the University of Minnesota, was the main speaker. His talk, "Man — A Tool Using Animal," was very stimulating. A spirited discussion on the character values of effective industrial-arts teaching followed.

♦ Donald Amelon, a graduate of the University of Missouri, is in charge of the newly organized general shop at Webster Groves, Mo.

Write for the new G-48 SHELDON Catalog showing and describing (with complete specifications) the complete line of 10", 11" and 12" Sheldon Lathes, accessories and attachments and Sheldon-Vernon Milling Machines and Shapers.

SEE SHELDON MACHINE TOOLS
At Booth 57 - 58
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SHELDON
makes all 3!

● THESE 3 quality machine tools are especially adapted to school use because of their:

Ample size — permits wide range of practical projects.

Standard design — true industrial tools with standard contracts.

Permanent accuracy — these tools hold their accuracy under student abuse, do not require constant rebuilding and servicing.

Safety — all drives completely enclosed; all speed changes made by external levers.

Price — these are moderate priced tools that school shops can afford.

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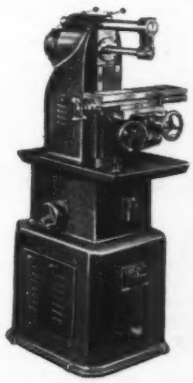
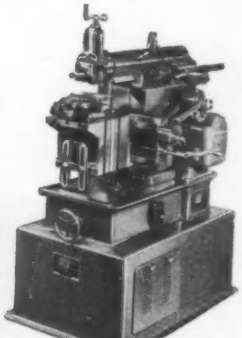
Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4244 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.


No. 3000
MILLING MACHINE

No. TS 56
11¼" SWING LATHE


No. 8000
12" SHAPER

Questions and Answers

ARTICLES ON PLASTICS

1128. Q.: I am interested in plastics. Let's have more please in the future. — *W. A. M.*

A.: You may be interested in articles on plastics which have appeared since 1940 in Industrial Arts and Vocational Education. I would refer you to the following list:

October, 1940, p. 338 — Teaching Ceramics in a 20 Sq. Ft. Space

September, 1942, p. 293; December, 1942, p. 432; September, 1943, p. 300; December, 1943, p.

(Continued on page 33A)

106 cost-saving ways to use electronics

Down-to-earth course trains your personnel to apply them in your plant

To get the most out of electronic equipment, your personnel must thoroughly understand its fundamentals, advantages, and limitations. To help you with this training problem, General Electric has prepared a complete, easy-to-take visual course in industrial electronics.

Here's what the G-E electronics training course offers—

1. **A 146-page instructor's manual,** designed to give your employees a *practical* understanding of the fundamentals of electronics...tell them how they're applied in modern industry. It enables a member of your organization to conduct the 12-lesson course.

2. **Twelve Slidefilm Lessons** each with its own record. The lessons are phrased in non-technical language ...devoted to *specific applications.*

3. **Twelve Review Booklets,** illustrated, for reference and home study.

Free inspection offer—

Once you've seen the scope of this fact-packed course, we know you'll be convinced it will pay off for you. So, examine the instructor's manual *without obligation.* After you've seen it, you will want to order the complete course which is offered at cost ... only $120.00.

FREE TO BUSINESS MANAGEMENT

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Schenectady 5, N. Y.

Please send me a sample copy of the G-E *Industrial Electronics Training Course Manual* (GES-3330) without cost or obligation.

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City _____

GENERAL ELECTRIC

Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

LeBLOND REGAL LATHES INTRODUCE INNOVATION

The standard taper key drive spindle nose is now being furnished in place of the threaded type on all LeBlond Regal lathes. The change-over has been affected without sacrifice of center distance capacity or any advantage associated with Regal lathes.

Taper key drive spindle nose

This change will give the LeBlond Regal lathes the benefit of all the advantages of this type of spindle nose including:

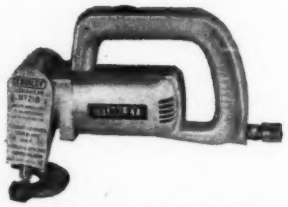
1. Easier and faster mounting of chucks and faceplates.
2. Safety lock-tight mountings.
3. Greater accuracy, better wear, longer life.
4. Low accessory inventory since special chucks and faceplates are no longer required for Regals.

For complete spindle nose specifications on any LeBlond Regal or engine lathe, send for bulletin SN-1. The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio.

For brief reference use IAVE—1201.

NO. 218 UNISHEAR

Stanley Electric Tools, New Britain, Conn., announces its new No. 218 Unishear. A production tool, the No. 218 Unishear cuts 18 gauge mild hot rolled steel (other materials in proportion) at a speed up to 15 feet per minute. Weighs only 4¾ lb. Improved blade action "feeds in" the work so that little effort is required by operator to cut straight lines, curves, angles, and notches with hairline accuracy. Full ball and roller bearing construction, automatic lubrication of plunger from gear housing, convenient slide operated switch, and minimum number of moving parts typify the quality design of this new tool. It is furnished with rubber covered three-wire cable, wrenches, clearance gauge and supply of lubricant; 115 volts (other voltages available).

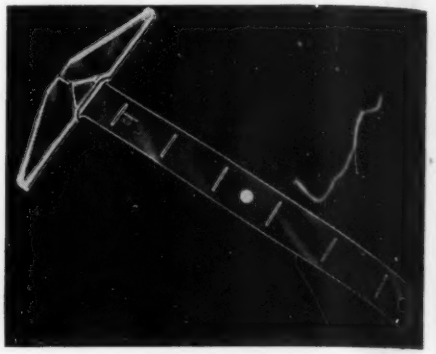


Stanley No. 218 Unishear

For brief reference use IAVE—1202.

AN IMPROVED T SQUARE

The new *Instrumaster* T square just placed on the market by Instrumaster Industries, the manufacturer, is constructed to provide longer life, continued accuracy, complete view of the work area on which the T square is placed, and reduced possibility of smudging the working surface.



The new T square

The Instrumaster T square is molded in one integral piece of shatterproof plastic. Other T squares have the head joined to the blade with screws. Because the Instrumaster T square is one piece, it remains accurate *even if dropped.*

It is made of clear plastic which permits full visibility of the surface on which the T square is placed.

Both sides of this T square are equally usable, offering greater convenience and twice the life.

It is made with ribs which protrude .020 in. above and below, enabling the T square to be moved across the working surface more smoothly. In addition, those drawing with ink do not have to be concerned about smearing the writing fluid.

This T square is available in two blade lengths, 18 and 24-in.

For further information write to Instrumaster Industries, 2457–14 West Jackson Blvd., Chicago 12, Ill.

For brief reference use IAVE—1203.

AIRCO ANNOUNCES NEW HAND TORCH FOR CUTTING STAINLESS STEEL

The Air Reduction Sales Company has announced the immediate availability of a new hand torch for cutting stainless steel using Airco's Flux-Injection process.

New Airco hand torch

Style 9016 of the new torch is 21 in. long. A torch 36 in. long also is available. Both

(Continued on page 28A)

Shop instructors will find this kit of eight slidefilms invaluable in helping start any program to promote safe shop practices among students. Those on limited budgets will be interested in its moderate cost.

Pictures and explanatory text are divided into instructional units, covering general safety subjects such as safety inspection, eye protection, aid for injuries and training for emergencies. Review and discussion questions assist the instructor in guiding group participation.

These slidefilms were prepared under the supervision of teachers thoroughly familiar with approved shop safety practices.

The **JAM HANDY** *Organization*

THE JAM HANDY ORGANIZATION
2821 E. Grand Blvd., Detroit 11, Michigan

☐ Send me your 8 slidefilms entitled "Basic Shop Safety" ($30).
☐ Send me information on other available slidefilms and moving pictures on other subjects.

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POSITION.....
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CITY.....STATE.....

Prices F.O.B. Detroit—Subject to Change Without Notice

THE ONLY SHAPER

having "down-draught" exhaust for chips from the cutters, and ½" and ¾" cutter-arbors formed on a solid one-piece vanadium-steel spindle — stronger, more accurate and safer than any 2-piece type.

BOICE-CRANE No. 2120 Spindle Shaper

Merely invert the quill to change from ¾" to ½" arbor without special tools. Large capacity. Runs wide mouldings and raised panels in one cut, and with our Ogee Sash Cutter Sets makes commercial grade sash with perfect fitting coped joints.

Large 1" diameter precision ground spindle, carried on two high quality dust and grease sealed ball bearings, stays true even after years of running wide, deep cuts. The bearing-seats in the quill casting, as well as the entire body of quill are all finely ground to precision dimensions.

The table features a large opening with provision for nested table rings, with these advantages: (1) all cutters, up to 6¼" diameter lower below table to undercut for greater safety. (2) Undercutting lessens danger of springing spindle. (3) Undercutting brings cutters closer to spindle bearings to reduce strain and wear.

SPECIFICATIONS

Table (has 1 miter-gauge groove): 20" x 27½"
Table with Front Wing: 28" x 27½"
Table-Opening Diameters: 6½", 3½", and 2"
Widest Bevel Edge Knife Capacity: 2½"
Widest Wing-Type Cutter Capacity: 3"
Largest Diameter Cutter Capacity: 6¼"
Vertical Spindle Travel: 1¾"
Spindle Diameter at Ball Bearings: 1"
Height from Floor to Table: 35"
Power: ½ h.p. for Cutters 3½" and less
1 h.p. for Cutters over 3½"
Two Models: 7,200 or 10,000 r.p.m.

WRITE FOR FREE LITURATURE ON

BAND SAWS
JIG SAWS
JOINTERS
THICKNESS PLANERS
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SAW JOINTERS
TILTING ARBOR SAWS
BELT SANDERS
SPINDLE SANDERS
SPINDLE SHAPERS
LATHES

Boice-Crane Power Tools can be seen in Booths No. 25 and 26 at the AVA Convention at Milwaukee, November 30 - December 4.

BOICE-CRANE COMPANY
932 Central Avenue
Toledo 6, Ohio

(Continued from page 26A)

lengths have a 90-deg. torch head. Special features of the new torch are:

1. Monel metal head promising durability and long trouble-free service.
2. Stainless steel tubes, providing rigidity and heat resistance.
3. Stainless steel lever and ribbed handle.
4. Remote control cutoff — automatically coordinates the flux feed with the cutting oxygen, and eliminates separate flux control.
5. Uses standard cutting tips.

For further information on the new torch or the Flux-Injection process write Dept. 1662, Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y., or the nearest Airco Sales Office.

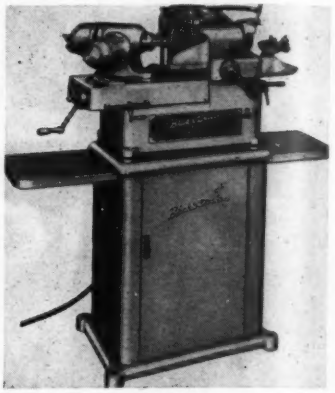
For brief reference use IAVE—1204.

No. 6 UNIVERSAL VALVE AND TOOL GRINDER

A new addition to the valve reconditioning line of The Black & Decker Mfg. Co., has just been announced. The No. 6 universal valve and tool grinder greatly expands the range of valve grinding capacity which The Black & Decker equipment can handle. It also has many applications for production or machine-shop tool grinding.

Because of the number and variety of adjustments that are possible this is truly a universal grinder. Flathead and 15-deg. valves can be handled without special attachments or adjustments. Valve-stem capacity ranges from ¼ to 1¼ in. and valve-head capacity goes up to 5¼ in. Large Diesel valves can be readily ground on the No. 6 grinder because of this large capacity. Equipped with a double-ended wheel spindle, rocker arms, valve stems, and tappets are quickly ground with the aid of attachments which are standard equipment.

Cylindrical grinding and sharpening of cutters and reamers can be handled with ease. If desired, the wheel-head assembly can be removed and replaced with special grinding attachments such as an internal grinder. The wheel-head carriage is movable for grinding large diameter straight-type tools such as reamers, circular punches, and dies.



Universal valve and tool grinder

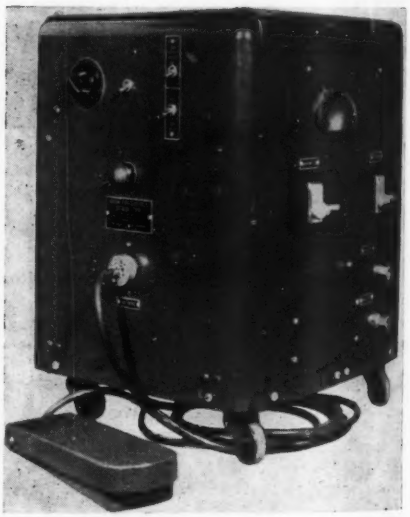
Standard equipment includes five twin-grip collets; collet push rod and nose piece for small valves; rocker-arm grinding attachment; diamond wheel dresser; cutter-type wheel dresser; micrometer valve-stem grinding attachment; and a universal depth gauge.

For further information address The Black and Decker Mfg. Co., Towson 4, Md.

For brief reference use IAVE—1205.

INERT-GAS-WELDING ATTACHMENT FOR A-C TRANSFORMER TYPE WELDERS

The Hobart Brothers Company, Troy, Ohio, have developed a high frequency stabilizer with added convenience control features to greatly simplify inert-gas-welding. This unit is designed for use with any standard A-C Transformer Type Welder of 500 amperes or less and provides in addition to high frequency stabilization, the following control features:



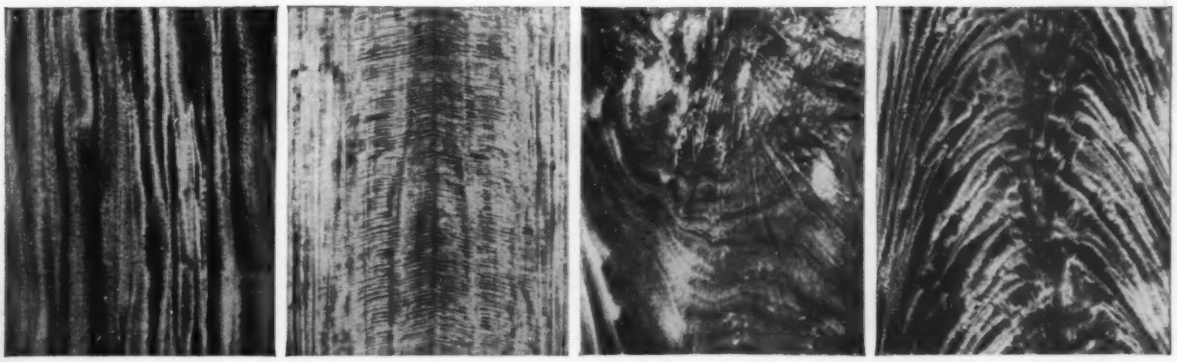
The Hobart Brothers Company inert-gas-welding attachment for a.c. transformer-type welders

A magnetic contactor which turns welding current and high frequency on and off, and operates the magnetic valves for turning water and gas on and off.

A time relay which controls the magnetic valves, so that the flow of gas and water con-

(Continued on page 30A)

are you SURE *you're getting* *genuine* MAHOGANY?



It's possible you're not. During the recent shortages, many woods have come into the market masquerading as Mahogany.

These woods may be *called* Mahogany (though often accompanied by some modifying term). To the casual eye, they may even *look* like Mahogany. But these woods are *in no way related* to genuine Mahogany!

Genuine Mahogany comes from only two kinds of trees. If it's American Mahogany, it must be *Swietenia;* if it's African Mahogany, it must be *Khaya.* Ask for these names in the lumber you buy—particularly now that genuine Mahogany is more plentiful.

And in buying furniture, look for the Mahogany labels. That is the only way you can really be *sure.*

"Mahogany—Wood of the Ages, Yesterday—Today—Tomorrow." 16 mm. color-sound story of Mahogany from its jungle home to the finished product. Bookings made on a selective basis according to size of school audience.

To protect you and your customers against substitution, the Mahogany Association issues these labels to manufacturers of genuine and honestly made Mahogany items. Use them in your personal selling.

MAHOGANY

MAHOGANY ASSOCIATION, INC.

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Chicago 1, Illinois

Please send new 7th edition of the 74-page Mahogany Book.

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"AFTER ALL . . . THERE'S NOTHING LIKE MAHOGANY"

. . . and

THE GRUMAN CO.
OF DETROIT
DEPENDS ON ITS
HARPER
ELECTRIC KILN
For Top Quality Porcelain Firing

Photo Courtesy VBF Co., Distributors of Gruman Ware.

"Immediate plans of the Gruman Company call for the use of the periodic Harper Kiln in the high firing of porcelain artware and the low firing of overglaze hand decorating."

The photograph shows Mr. Louis Gruber stacking his SK-151416 Kiln in the Gruman Studio, where decorating of ware is under the capable direction of Mrs. Mellosine Gruber and porcelain forms will be originals by Mrs. Virginia Forsman. Mrs. Gruber and Mrs. Forsman have gained considerable prominence in teaching and exhibiting in Ceramics and other art mediums.

Their choice of a Harper High Temperature Kiln was determined by their need of a kiln with a wide temperature range to enable them to alternately fire low temperature overglaze decorations, and high temperature porcelains. Harper kilns meet these requirements. They are equipped with Globar Non-Metallic heating elements which provide for temperatures to 2500° F. and a clean oxidizing atmosphere, resulting in bright glazes and true overglaze colors. They are designed to operate with multiple tap transformers which provide for close control of temperature rise in the kiln, resulting in evenly fired ware.

Let us meet your firing requirements with a Harper periodic or tunnel kiln.

HARPER
ELECTRIC FURNACE CORP.
1445 Buffalo Ave. Niagara Falls, N. Y.

Representatives in all principal cities

(Continued from page 28A)

tinues for a predetermined time (adjustable up to 180 seconds) after the arc has been extinguished. This protects the weld metal from oxidation until it has had time to solidify.

A foot switch which plugs in the front of the cabinet is standard equipment. In addition to the foot switch, a tumbler switch on front of the cabinet makes it possible to cut the entire unit out of circuit and operate the welder alone, as a standard A-C Transformer, without high frequency, water, or gas.

Welding and ground cable terminals and gas and water connections, are located on the sides of the cabinet. The same welding terminals are used whether or not the inert-gas-welding attachment is in use.

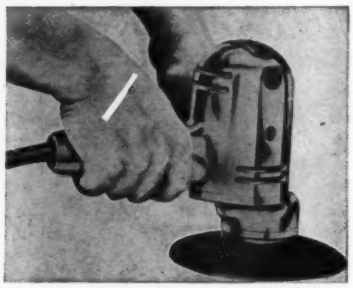
All of the foregoing features are compactly arranged in a steel case 21 in. high, 19 in. wide, and 18½ in. deep. Net weight is 125 pounds and the unit is mounted on easy rolling casters.

For brief reference use IAVE—1206.

NEW PORTABLE 5 IN 1 WOODWORKING TOOL

A powerful 5 in 1 portable electric tool, the D-6, for the woodworking and painting industry, has been announced by the Porter-Cable Machine Company, 1714 N. Salina St., Syracuse 8, N. Y. The D-6 will sand, polish, cut, drill, and stir paint by simply changing the attachments.

The D-6 will drill wood, plastics, and compositions up to a 1/3-in. hole, and metals up to ¼-in. hole. The drill chuck can be used for numerous standard attachments such as: hole saw, wire brushes, etc. A spindle mixer can be attached for stirring paint and other thick liquids.



New portable 5 in 1 tool

By attaching a disk sander, wood can be finished easily, and old paint can be removed quickly from houses, hulls, and decks of boats. By substituting a lamb's wool buff, furniture and other surfaces can be polished to high luster.

This Porter-Cable Machine weighs less than 6 lb., and can be transferred quickly to any job, used overhead, vertically, and in cramped spaces. It has a 5/8-in. shaft and will not break or bend even under extreme service conditions. The D-6 uses a 6-in. diameter grinding disk. A special bearing takes heavy end thrusts under pressure of sanding, grinding, or drilling.

A guide grip can be attached to either side of the machine for left- or right-handed operators, or it can be removed for use in limited spaces.

Specifications are: motor, universal 115 volts d.c.–a.c., 25–60 cycle, single phase; spindle, 5/8 in. 11 thread with ¼-in. hex. socket in end; speed (approximately) 3000 r.p.m. no load, 2000 r.p.m. normal load; over-all dimensions, 7⅜ in. high, 7 9/16 in. wide, and 11 ⅛ in. long. The net weight is 5 lb. 13 oz.

For brief reference use IAVE—1207.

DITTO CUTS D-15 PRICES

The manufacturers of Ditto duplicating machines have announced a 10 per cent price reduction on their popular D-15 direct process duplicator.

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Immediate delivery will be made on all orders destined for direct shipment to users.

For further information write to Ditto, Inc., Harrison and Oakley Blvd., Chicago 12, Ill.

GROWTH OF THE DELTA MANUFACTURING COMPANY

In 1919, Herbert Tautz and William Peters laid Delta's foundation, in a one-car alley garage in Milwaukee, Wis. Eventually, success in the manufacture of paper testing instruments enabled them to move to a small shop at Third and Meinecke Streets in Milwaukee. In 1923, the partnership of Tautz and Peters was dissolved in friendly understanding.

Shortly thereafter Tautz began the manufacture of a new "toy"—a small, hand-operated scroll saw, and thus launched the Delta-Milwaukee line of power tools. With the development of the little scroll saw from a toy into a home workshop tool, and with the development of other motorized tools, Delta began a phenomenal growth. In 1929, Tautz purchased a building with 20,000 sq. ft. of floor space at Holton and Vienna Streets, Milwaukee. But not even new floors and additions gave the space needed to meet the growing demand for Delta tools. The depression stimulated instead of stopped the demand. Home workshops sprang up by thousands and metal and woodworking industries found compact but highly efficient Delta tools helped out production costs. Schools discovered Delta tools were ideal to train the nation's youth in diversified crafts. In 1935 Tautz ordered the construction of a new Delta plant at 600 E. Vienna. This plant had a floor space of 80,000 sq. ft.

In 1939, Mr. Tautz retired, and in 1944, Delta became a division of the newly founded Rockwell Manufacturing Company with Col. Willard Rockwell as chairman of the board.

After meeting the war demand for compact, accurate tools for industry during World War II, Delta resumed its peacetime production of tools for home workshops and schools as well, only to discover the demand had increased tremendously. In 1946 plans were made for building a new and modern addition to the east of the older building. This new addition, completed recently, practically doubles the floor space of Delta, adding 73,000 sq. ft. to give a total of 153,000 sq. ft. It enables Delta to accommodate its 750 employees comfortably, and is indeed a far cry from the small back-alley garage, where Delta had its beginning.

THE 1948–49 LINCOLN SCHOLARSHIP PROGRAM

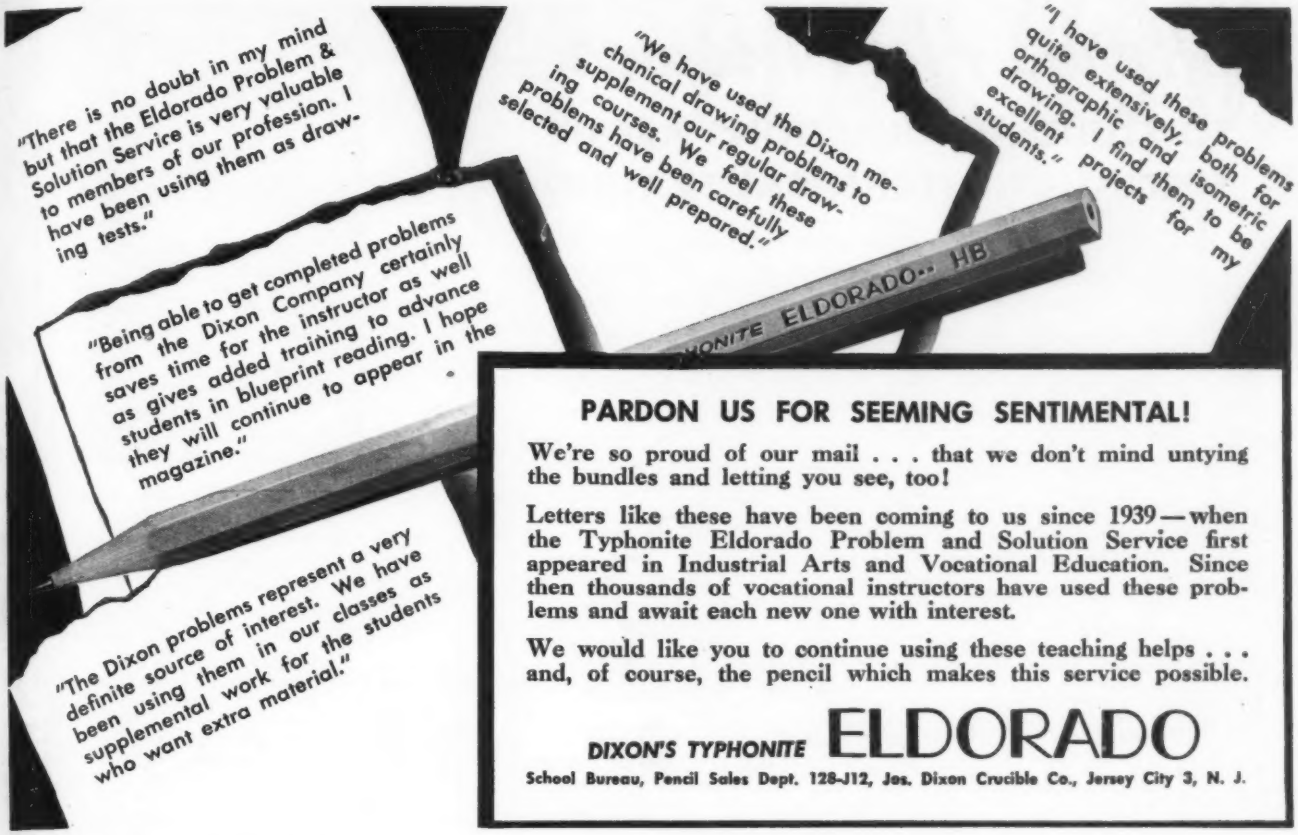
September 15, 1948, to April 1, 1949, is the period for submitting entries for the James F. Lincoln Arc Welding annual Engineering Undergraduate Award and Scholarship Program. The current competition is the second in a ten-year series of programs which offer to engineering undergraduates (including agricultural engineers) the opportunity to compete in the preparation of papers on various phases of welding for monetary awards and scholastic and industry recognition.

The program contains two interdependent plans: The Award Plan and the Scholarship Plan. Under the Award Plan, engineering students of various engineering schools and colleges will submit papers on arc welding applications or arc welding technology. Awards for the best papers will be made to students as follows: first award, $1,000; second, $500; third, $250. Then there are 4—$150; 8—$100; 12—$50; and 50—$25 awards.

The Scholarship Plan is as follows:

The institutions, in which the three top awards are made, will receive amounts of money equal, respectively, to those awards. These amounts are to be used for the purpose of scholarships in the departments in which the award students are registered. The department of the institution in which the first award winner is registered will receive $1,000 for four annual scholarships of $250 each. The department of the second award winner will receive $500 for two annual scholarships of $250 each. The department of third awardee will receive $250 for one annual scholarship.

The rules of the program may be obtained by writing The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.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QUESTIONS AND ANSWERS

(Continued from page 25A)

431; April, 1944, p. 158; May, 1944, p. 204 — Molding Plastics in High School
April, 1944, p. 24A — Modern Picture Frame
May, 1944, p. 199 — Plastic Switch Plate
October, 1944, p. 342 — Plastics in the Classroom
November, 1944, p. 380 — A Plexiglas Bud Vase
February, 1945, p. 66 — Plastics in Occupational Therapy
May, 1945, p. 216 — Plastic Bedside Lamp
November, 1945, p. 410 — How to Finish Plastics
April, 1946, p. 173 — General Operations in the Working of Plexiglas
May, 1946, p. 218 — Plasticraft Candleholder
June, 1946, p. 256 — Plastic Résumé
October, 1946, p. 343 — Plastics and the Returning G.I.
October, 1946, p. 376 — The Casting of Plastics in School and Home Shops
December, 1946, p. 465; January, 1947, p. 19 — A Course in Plastics
March, 1947, p. 134 — Castolite Projects in the Industrial-Arts Shop
October, 1947, p. 339 — Plastic Gavel and Anvil
October, 1947, p. 353 — Designs for Plastic Pulls
November, 1947, p. 390 — Short Course in Plastics
March, 1948, p. 114 — Course in Plastics

— *J. J. M.*

A FINISH FOR WHITE BIRCH

1129. Q.: Will you please tell me how to finish a white birch tea cart? I want a durable, easily maintained, light finish, but not necessarily as colorless as the natural wood. — *E. A. C.*

A.: In regard to the white birch tea cart I would like to suggest that the owner follow the specifications for the penetrating wood finish by DuPont as listed on page 123 of my book.* The color can be a very light shade of amber, honey, or New England Maple such as would be had from the use of ½ teaspoonful of stain powder per quart of hot water or nongrain raising stain solvent. The DuPont finish would be easy to apply, rub, and wax in one or two coats as desired. The resulting effect is very fine, tough, and durable. — *Ralph G. Waring.*

ARTICLES ON SAFETY

1131. Q.: Kindly give me a bibliography of articles on safety that have appeared in past issues of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine. — *S. A. Y.*

A.: Articles on School Shop Safety which have appeared in the last 11 volumes of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION:

1937
January, p. 12 — Building a Safety Concept
March, p. 42A — America's Deadliest Weapon
May, p. 162 — Safe-Driving Test
September, p. 288 — Safety Rules for the Print Shop
October, p. 326 — The Motor Club
November, p. 375 — Driving With Safety
November, p. 388 — Safety Rules and a Pass Card
1938
January, p. 21 — General Shop Safety Instructions
March, p. 130 — Effective Safety Instruction Through Boys' Clubs
April, p. 172 — First Aid in the Shop
June, p. 240 — Dangerous Practice on the Lathe
October, p. 348 — Safety Rules
November, p. 385 — Final Safe-Driving Examination
December, p. 426 — A Study of Traffic Safety — I
1939
January, p. 20 — A Study of Traffic Safety — II
March, p. 38A — Training Safe Workers for Industry
March, p. 46A — Safety Rules for the Millroom
May, p. 205 — Safety Education
June, p. 227 — Teaching High School Youth to Drive
December, p. 419 — Safety Education
1940
April, p. 168 — Traffic Safety Sign
April, p. 170 — Safe Driving
April, p. 175 — Safety Zone Lines
April, p. 176 — Teaching Aids in Safety
May, p. 197 — Simple Device for Testing Reaction Time
September, p. 276 — Safety Education in the School Shop
December, p. 419 — Press Feeder's Safety Device
December, p. 428 — Safety Check List
1941
September, p. 267 — Safety in School Shops
September, p. 303 — Print-Shop Safety Rules
September, p. 307 — Safety-First Information Sheet
November, p. 378 — Outline of Safe Driving Course
November, p. 384 — Safety in School Shops
1942
February, p. 50 — Safety in the School Shops
March, p. 32A — Safety and the Shop Teachers
May, p. 197 — Accent on Safety
September, p. 317 — Grinding Wheel Safety
November, p. 379 — Safety Cartoon
December, p. 436 — Safety in School Shops
1943
March, p. 135 — School-Shop Safety
June, p. 257 — If You Have Arc Welding in Your School
1944
March, p. 122 — Auto Mechanics and Auto Safety
March, p. 125 — Safety in the School Shop
April, p. 153 — Teaching "First-Aid Fire Control"

(Continued on next page)

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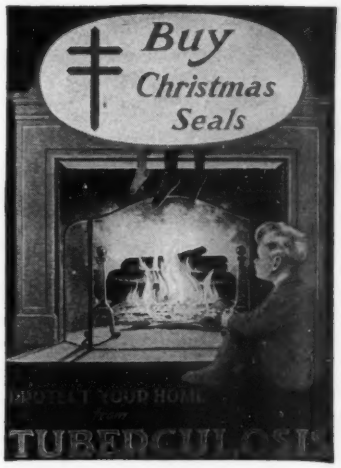
(Continued from previous page)

May, p. 183 — Industrial Safety at a School of Vocational and Adult Education
September, p. 299 — Safety in the School Shop
October, p. 318 — What Every New Worker Should Know About Safety
October, p. 40A — Safety in the School Shop
1945
February, p. 85 — Safety in the School Shop
March, p. 131 — Safety Provisions and Regulations for School Shops
March, p. 133 — Operating the Wood Jointer Safely
April, p. 154 — Eye Troubles of Machinists
April, p. 186 — Visual Aids
May, p. 233 — Safety Reminders for Welders
May, p. 226 — Placement of Portable Fire Extinguishers
September, p. 307 — Something New in Safety
September, p. 314 — Safety Rules for the Machine Shop
September, p. 315 — Take Precautions
September, p. 323 — Safety and the Circular Saw
October, p. 369 — Check Your Fire Extinguishers
November, p. 423 — Etching Press Safety Device
1946
February, p. 22A — Lathe Safety Screen and Some Safety Hints
March, p. 115 — Contrast Color Painting for Shop Safety
June, p. 262 — Magnetic Sweeper
September, p. 303 — Hernia in Industry
November, p. 379 — Moral and Legal Aspects of Safety Education
November, p. 18A — Fire Hazards and Plastics
1947
January, p. 40 — Driver Education and Training
January, p. 42 — Shop Safety Rules and Aids
April, p. 169 — A Mark to Shoot At
May, p. 220 — Looking Into the Future
December, p. 438 — How to Avoid Winter Accidents

—*J. J. M.*



News Notes

♦ Thirty-seven industrial-arts students of the "Modern Industries" class, Ball State Teachers College, Muncie, Ind., spent a day in Chicago on a field trip on August 6, 1948. The purpose was to contact, firsthand, as much basic industrial material as possible. The trip included viewing the scholastic industrial-arts exhibit, a thorough survey of the Museum of Science and Industry, and a study of transportation at the Transportation Exposition. The class was composed of both graduate and undergraduate students. Fred J. Schmidt, Jr., was instructor of the class in "Modern Industries."

♦ Prospects are for a relatively big increase in the number of jobs in the plastics products industry during the next year or two and for steady growth in employment thereafter. Most of the openings, however, will be for inexperienced persons to be trained for semiskilled and unskilled production jobs. These are the main conclusions of a report issued by the Bureau of Labor Statistics on the "Employment Outlook in the Plastics Products Industry." The report is one of a series prepared by the Bureau's Occupational Outlook Service to provide information for use in the vocational counseling of veterans and other persons making the choice of an occupation.

♦ In co-operation with the New York City Board of Education, the Forest Service, U. S. Department of Agriculture, has begun production of a new series of six conservation radio dramas entitled "Bill Scott — Forest Ranger," which early this school year will be made available in the form of transcriptions for use by other local stations and in high schools and classrooms throughout the country.

This will be the second time that "Bill Scott—Forest Ranger" has been heard on various local radio stations, school broadcast systems, playback machines in classrooms and educational workshops, and in local studio dramatizations of his forest adventures. In co-operation with the New York Board of Education, a similar series was produced and broadcast in 1946. Given their first broadcast on the New York municipal stations, those 1946 programs have since been heard over more than 100 local independent stations and through about 80 school broadcasting systems, classroom "playbacks," conservation workshops, and school training courses. In all, they have been used in 35 states, Alaska, and the District of Columbia.

(Continued on page 36A)

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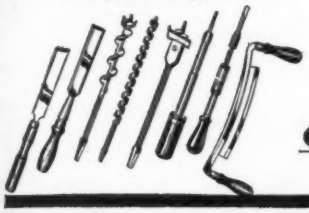

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ELEMENTS OF RADIO SERVICING: *Marcus and Levy*

RADAR PRIMER: *Hornung*

PRACTICAL SHOP MATHEMATICS—New 3rd Edition: Volume I: *Wolfe and Phelps* (Volume II in press)

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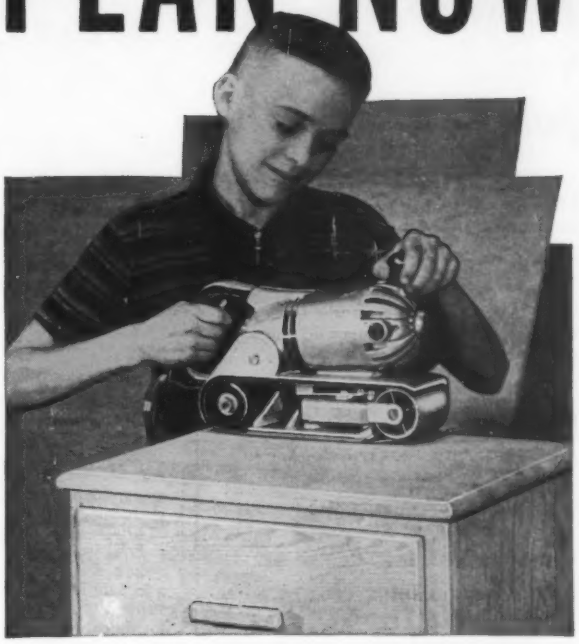

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(Continued from page 34A)

In order to bring home a better understanding of the value of forests and of their vital relation to the nation's economic and social welfare, the "Ranger Scott" programs have well-planned educational aids for use in connection with the broadcasts. These are designed to provide the basis for up-to-the-minute classroom discussions of conservation. Lists of the material available for this purpose may be obtained from the U. S. Forest Service, Washington, D. C.

♦ Backed by over 900 firms in a six-state area, Graphic Arts Industry, Inc., started its Graphic Arts Technical School, day and evening classes, on October 4, 1948. The school is located at 1104 Currie Ave., Minneapolis 3, Minn.

Courses offered include hand composition and Monotype keyboard and caster operations and maintenance, advanced and elementary estimating, cost accounting, layout and design, creative printing salesmanship and orientation for junior executives. Future courses will be offered in offset platemaking and presswork, bindery work, Linotype-Intertype operation, and letterpress presswork.

The school believes that time as an element in graphic-arts education is not as significant as generally believed, but that provision must be made for obvious individual capacities to absorb and assimilate instruction, and recognizes individual differences in persons based on previous schooling or experience, aptitudes, and interest in the work. It further believes that inflexible school courses of study militate against the most economic procedures in training people for careers, and in providing graphic arts establishments with workers adequate in number and proficient in skills of high value acceptable to industry and to the individual.

Students are selected with or without schooling or experience in printing. No discrimination is shown with regard to locality of residence, age, sex, race, or creed.

R. Randolph Karch has been appointed director.

♦ Get your advance copy of the new, streamlined manual, "School Savings in Action," by addressing your requests to the Education Section, U. S. Savings Bonds Division, Treasury Department, Washington, D. C. This booklet is especially designed to give the classroom teacher the information he needs to install and operate a School Savings Program.

♦ A program for training vocational guidance workers and job placement technicians specializing in the employment problems of persons disabled by cerebral palsy and other multiple handicaps has been announced by Alpha Gamma Delta, international women's college fraternity, and the National Society for Crippled Children and Adults, Chicago.

Lawrence J. Linck, executive director of the National Society, said that the fraternity, through its 59 undergraduate and 100 alumnae chapters throughout the United States, will provide an annual grant of $5,000 for a limited number of in-service-training fellowships to be awarded by the National Society.

For further information address The National Society for Crippled Children and Adults, Inc., 11 South LaSalle St., Chicago 3, Ill.

♦ Five hundred and eighty-four trade and vocational school directors and teachers from Massachusetts recently attended a week-long summer conference held by the State Dept. of Education, Vocational Division, at the State Teachers College, Fitchburg, Mass., where they brushed up on vital new industrial developments which affect training they must hand on. Instructors to teach the teachers were supplied by over 30 companies including many well-known organizations such as Carboloy Company, General Electric, Westinghouse, General Motors, U. S. Plywood Company, and the New York Central Railroad.

Subjects covered at the vocational conference included cemented carbides, powdered metallurgy, various aspects of wood technology, numerous phases of welding, maintenance and repair of electric motors, industrial lighting, painting and finishing, and many other technical subjects. Question and answer sessions high-lighted the conference discussions.

Also featured for the benefit of trade school teachers were plant trips to Heald Machine Company, Worcester; American Writing Paper Company, Holyoke; and General Electric Welding Unit Manufacturing Company, Fitchburg.

♦ Scholastic Industrial Arts Awards starts its third year this fall by adding radio electronics to the program.

The second annual national industrial-arts awards fair was held at the Chicago Museum of Science and Industry until October 15 — three weeks beyond the announced closing date.

This year students may enter their work in one of four groups. Group I is for students in the seventh and eighth grades in elementary, junior, or general four-year high schools. Group II is for students in grades 9 and 10 who receive instruction for less than 10 clock hours per week in industrial arts. Group III is for students in grades 11 and 12 who receive instruction for less than 10 clock hours per week in industrial arts. Group IV is for students in vocational, trade and industrial, or technical schools who spend 10 or more clock hours per week in shop, laboratory, or drawing room, receiving instruction in the subject represented by the entry.

Divisions and classifications in which work may be entered are: wood, metal, drawing, plastics, and radio electronics.

Prizes of both cash and valuable merchandise are offered for winners, and scholastic certificates of merit are presented both to winners and to students whose entries receive honorable mention. This year, for the first time, instructors whose students win honors are to be presented with a Certificate of Achievement.

Free rules booklets with sample entry blanks may be obtained by addressing a request to George H. Fern, Director, Scholastic Industrial Arts Awards, 7 East 12th St., New York 3, N. Y.

♦ The industrial and occupational characteristics of each state are described in a series of pamphlets published by the Veterans Administration for use in guidance of veterans, and now placed on sale to the general public. The pamphlets were prepared for the Veterans Administration by the Occupational Outlook Service of the Bureau of Labor Statistics.

The pamphlet for each state shows, with charts and figures, the major industries and occupations, the industrial trends since 1940, population trends and outlook.

Nearly 200 occupations of interest in guidance are listed, with figures on the number employed in the state and in each city of 100,000 or more in 1940. The occupations are keyed to the forthcoming *Occupational Outlook Handbook*, indicating to the counselor those for which a complete report on trends, outlook, duties, qualifications, earnings and working conditions is available in the *Handbook*.

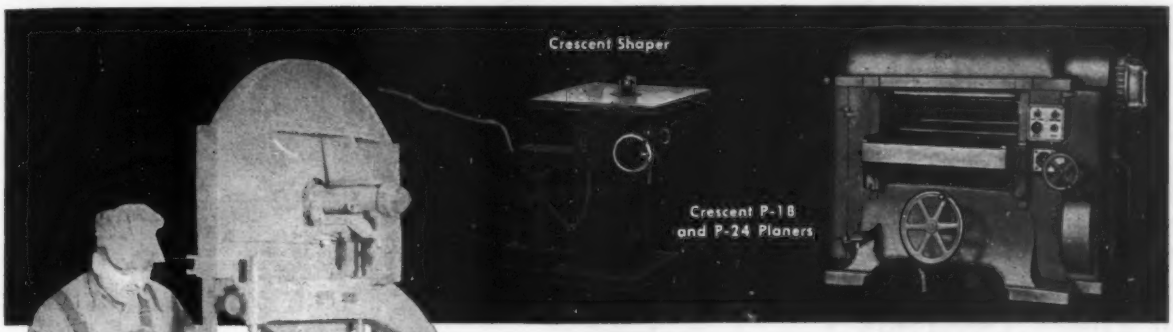
The pamphlets, issued under the title "Occupational Outlook Information Series for States," VA Pamphelt Series 7-2, may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 10 cents each. There is a separate pamphlet for each of the 48 states and the District of Columbia. Purchasers should specify the state or states desired.

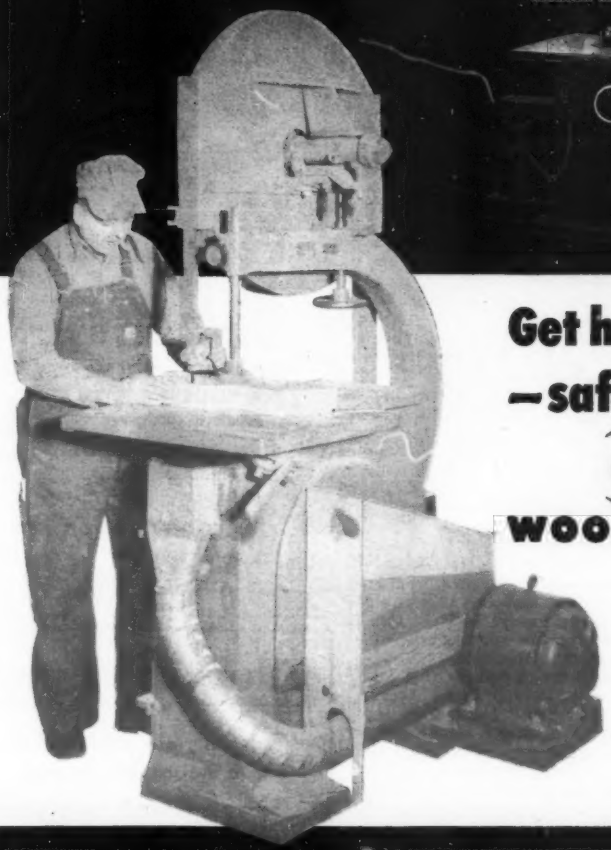
♦ Governor Oscar A. Rennebohm received a bronze plaque honoring the state of Wisconsin for its progress in driver education during the past school year. The plaque represents the "Superior Award" of the annual Driver Education Award Program sponsored by the Association of Casualty and Surety Companies, 60 John St., New York 7, N. Y.

North Dakota will receive the only other Superior Award given this year. Seven other states will receive lesser awards.

In order to qualify for the Superior Award, Wisconsin had courses in safe driving in more than 50 per cent of its secondary schools and had more than half of the eligible students enrolled in them. By actual count, 298 of Wisconsin's

(Continued on page 38A)





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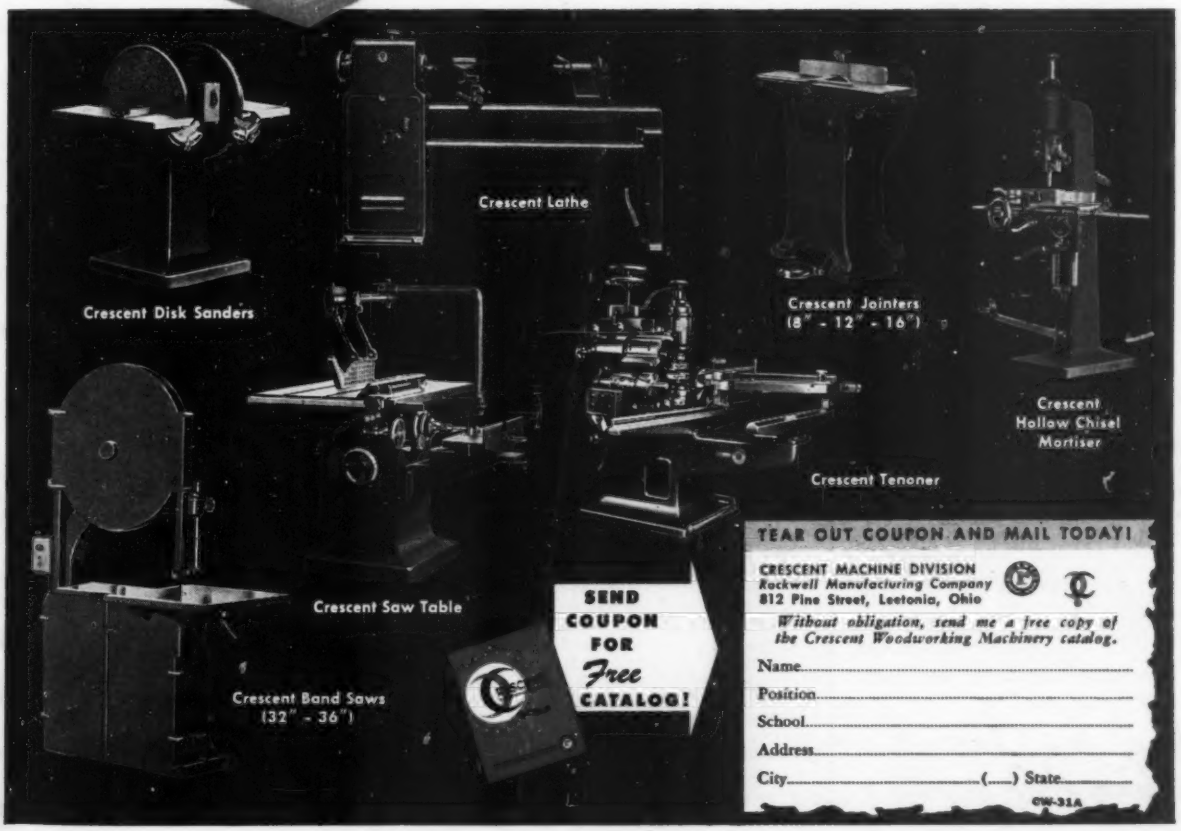

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(Continued from page 36A)

463 high schools had driver education courses during the past school year; 18,959 of the 34,258 eligible students were enrolled.

Aside from Wisconsin and North Dakota, other states receiving awards this year include: special award — Arizona and Delaware; meritorious award — Illinois, Massachusetts, New Jersey, Virginia, and West Virignia.

♦ Construction of the industrial-arts unit of the Practical Arts Building at Ball State Teachers College, Muncie, Ind., was begun at 1:45 p.m., Wednesday, July 14, 1948, when Robert M. Critchfield of Anderson, president of the State Teachers College Board, turned the first spadeful of dirt.

Dr. John R. Emens, president of the college, acted for the school when he turned over the second spadeful. Representing the industrial-arts department, Dr. Fred J. Schmidt, head of the department, followed suit. John Wearly, Huntington, represented the student body by concluding the ceremony with a fourth spadeful.

George A. Ball, Muncie member of the State Teachers College Board; Ben H. Watt, Indianapolis, state superintendent of public instruction; Dr. Ralph Tirey, president of Indiana State Teachers College; college officials, and members of the industrial-arts department, both faculty and students, attended the ground-breaking ceremony.

First of three parts of the Practical Arts Building, the industrial-arts unit will be a single-story building housing machinery, equipment, offices, and classrooms. Expected construction time is one year at a cost of approximately $690,000. Construction of the home-economic and business education units will begin at a later date.

When all three units are completed, the new building will extend north from Riverside Avenue and west of North and South Halls. Contracts for the construction of a service tunnel under Riverside Avenue, to satisfy heating needs of the new building were let Wednesday afternoon following a meeting of the State Teachers College Board.

New Publications

Principles of Vocational Education

By Franklin J. Keller. Cloth, 402 pp., 5¾ by 8¼ in. $3.50. D. C. Heath and Co., 285 Columbus Ave., Boston 16, Mass.

A book written by a man who has had years of weighty experience with the subject treated. It presents the philosophy of vocational education in a clear and forceful manner, besides portraying with sharp lines the author's impressions of what distorted education produced in Germany under the leadership and direction of Hitler and his vile gang.

The book is divided into 19 chapters under the following headings: (1) Prologue: Education is Life; (2) A Concept of Work; (3) An Interpretative History of Vocational Education; (4) Size and Quality of the Problem; (5) Primacy of the Person; (6) Motivation, Interest, and Learning; (7) Reality: The Approach to Valid Subject Matter; (8) Democracy in Education; (9) Methods of Teaching; (10) Thinking and Intelligence; (11) Physical and Mental Health; (12) Ethics and the Good Life; (13) Administration and Supervision — Local Units; (14) Administration and Supervision — Larger Policy; (15) Types of Vocational Education; (16) Types of Schools; (17) Teacher and Counselor; (18) Evaluation; (19) Philosophy of Education in a Bemused World; Index.

Practical Residential Wiring

By John F. Nowak. Cloth, 495 pp., 6¼ by 9¼

(Continued on page 40A)

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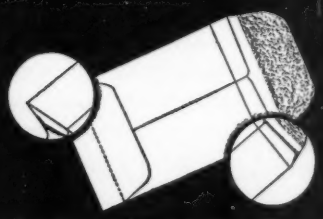

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(Continued from page 38A)

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By Cyril Pearce. Cloth, 95 pp., 5⅝ by 8¾ in., illus., $4.50. B. T. Batsford, Lt., 122 East 55th St., New York 22, N. Y.

This book shows a number of toys and models which may be made by the teacher or the students for use at home or in school.

Twelve working toys, 11 architectural models, 6 geographical models, and 8 scientific models are described.

The book was made and printed in Great Britain.

Handbook of Elementary Technical Mathematics

By John W. Greenwood and M. Irving Criswell. Cloth, 186 pp., 5⅝ by 8¼ in., illus., $2.10. Prentice-Hall, Inc., 70 Fifth Ave., New York City.

A textbook offering mathematics for a number of technical fields. It shows how formulas may be evaluated; how to factor and use fractional equations; transform and develop formulas; operate a slide rule; solve problems involving ratio and proportion, radicals, square root, exponents, quadratic and radical equations, numerical trigonometry, simultaneous equations, etc.

Trigonometry and the application of geometry to numerous practical problems also is part of the text material.

The appendix contains a number of very useful mathematical tables.

Graphic Arts Crafts

By D. Kauffmann. Cloth, 244 pp., 5½ by 8½ in., illus., $2.75. D. Van Nostrand Co. Inc., 250 Fourth Ave., New York 3, N. Y.

This book is a survey of the various graphic-arts processes, from linoleum block cutting through the history of wood engraving, down to how to handle a squeegee in silk-screen printing. Chapters are based upon processes. There is a chapter for each of the following: linoleum block printing, wood engraving, etching, silk-screen printing, lithography, bookbinding, and letterpress printing. The emphasis is upon information, not commercial practices.

Every process is complete. For example, under etching, you will find the aquatint, bitten line, celluloid drypoint, metal drypoint, mezzotint, and soft ground. The index gives quick information as to the coverage of all the other processes.

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Basic Mathematics for Radio

By George F. Maedel. Cloth, 339 pp., 6⅛ by 9¼ in., $4.75. Prentice-Hall, Inc., New York, City.

A text for those studying the technical problems arising in gaining a mastery of science as applied to radio.

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Guidance Testing

By Clifford P. Froehlich and Arthur L. Benson. Paper, 104 pp., 6 by 9 in., $1. Science Research Associates, Chicago, Ill.

(Continued on page 42A)

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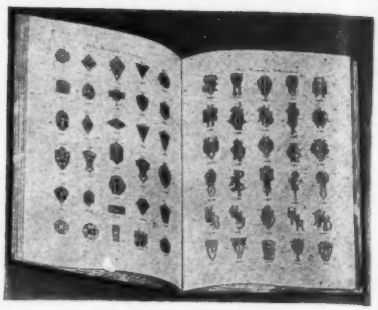

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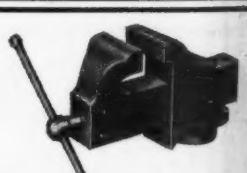

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